FLOOD INSURANCE STUDY

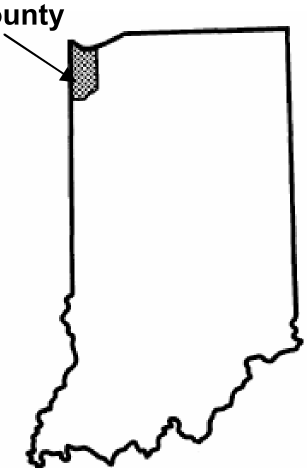
LAKE COUNTY, INDIANA
AND INCORPORATED AREAS

VOLUME 1 OF 3

COMMUNITY NAME	COMMUNITY NUMBER
CEDAR LAKE, TOWN OF	180127
CROWN POINT, CITY OF	180128
DYER, TOWN OF	180129
EAST CHICAGO, CITY OF	180130
GARY, CITY OF	180132
GRIFFITH, TOWN OF	185175
HAMMOND, CITY OF	180134
HIGHLAND, TOWN OF	185176
HOBART, CITY OF	180136
LAKE COUNTY (UNINCORPORATED AREAS)	180126
LAKE STATION, CITY OF	180131
LOWELL, TOWN OF	180137
MERRILLVILLE, TOWN OF	180138
MUNSTER, TOWN OF	180139
NEW CHICAGO, TOWN OF	180140
SCHERERVILLE, TOWN OF	180142
SCHNEIDER, TOWN OF	180143
ST. JOHN, TOWN OF	180141
WHITING, CITY OF	180313
WINFIELD, TOWN OF	180515

PRELIMINARY

Lake County



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
18089CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. It is advisable to contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Selected Flood Insurance Rate Map panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zones	New Zone
A1 through A30	AE
B	X (shaded)
C	X
V1 through V30	VE

Initial Countywide FIS Effective Date: **PRELIMINARY**

TABLE OF CONTENTS – Volume 1

FIGURES

TABLES

TABLE OF CONTENTS – Volume 2

TABLES

EXHIBITS

TABLE OF CONTENTS – Volume 3

EXHIBITS

FLOOD INSURANCE STUDY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports, Flood Insurance Rate Maps (FIRMs) and/or Flood Boundary and Floodway Maps (FBFMs) in the geographic area of Lake County, Indiana, including the Cities of Crown Point, East Chicago, Gary, Hammond, Hobart, Lake Station and Whiting, the Towns of Cedar Lake, Dyer, Griffith, Highland, Lowell, Merrillville, Munster, New Chicago, Schererville, Schneider, St. John and Winfield and the unincorporated areas of Lake County (referred to collectively herein as Lake County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR. 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS Report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the FEMA DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Information on the authority and acknowledgements for the previously printed FIS and FIRMs for Lake County is shown below.

Town of Cedar Lake	The hydrologic and hydraulic analyses for this study were performed by Harza Engineering

	Company for the FIA under Contract No. 11-4803. This study was completed in July 1979.
City of Crown Point	The hydrologic and hydraulic analyses for this study were performed by Clyde E. Williams and Associates, Inc., for the FIA under Contract Number H-4013. This work, which was completed in July 1977, covered all flooding sources affecting the City of Crown Point.
Town of Dyer	For the original, May 15, 1984, FIS, the hydrologic and hydraulic analyses were prepared by the U.S. Army Corps of Engineers (USACE), Chicago District, for FEMA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 19. That work was completed in July 1978, For the September 18, 1986, FIS, the hydrologic and hydraulic analyses were prepared by Lindley & Sons, Inc., for FEMA. That work was completed in August 1992.
City of East Chicago	The hydrologic and hydraulic analyses for this study were performed by the USACE, Chicago District, for the FIA, under Inter-Agency Agreement No. LAA-H-10-77, Project Order No. 10. This study was completed in April 1978.
City of Gary	The hydrologic and hydraulic analyses for this study were performed by the USACE, Chicago District, for the FIA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 19. This study was completed in December 1978.
Town of Griffith	The hydrologic and hydraulic analyses for this study were performed by the USACE, Chicago District, for the FEMA, under Inter-Agency Agreement No. (IAA)-H-9-79, Project Order No. 11. This study was completed in November 1980.
City of Hammond	The hydrologic and hydraulic analyses for this study were performed by the USACE, Chicago District, for the FIA, under the Inter-Agency Agreement No. IAA-l-17-76, Project Order No. 19. This study was completed in September 1978.
Town of Highland	The hydrologic and hydraulic analyses for this study were performed by the USACE, Chicago District, for FEMA, under Inter-Agency

	Agreement No. IAA-H-9-79, Project Order No. 11. This study was completed in December 1980.
City of Hobart	The hydrologic and hydraulic analyses for this study were performed by Clyde E. Williams and Associates, Inc., for the FIA, under Contract No. H-4013. This work, which was completed in June 1977, covered all significant flooding sources affecting the City of Hobart.
Lake County (Unincorporated Areas)	The hydrologic and hydraulic analyses for this study were performed by the United States Department of Agriculture, Soil Conservation Service (SCS), for the Federal Insurance Administration (FIA), under Inter-Agency Agreement No. H-18-75, Project Order No. 4, and Inter-Agency Agreement No. H-8-77, Project Order No. 3. This study was completed in July 1978.
City of Lake Station	The hydrologic and hydraulic analyses for this study were performed by Clyde E. Williams and Associates, Inc., for the FIA, under Contract No. CN-803-76. This work, which was completed in June 1977, covered all significant flooding sources affecting the City of Lake Station.
Town of Lowell	The hydrologic and hydraulic analyses for this study were performed by the SCS of the U.S. Department of Agriculture for the FIA, under Inter-Agency Agreement No. H-8-77, Project Order No.1. This study was completed in May 1978.
Town of Merrillville	The hydrologic and hydraulic analyses for this study were performed by Clyde E. Williams and Associates, Inc., for the FIA, under Contract No. H4013. This work, which was completed in June 1977, covered all significant flooding sources in the Town of Merrillville.
Town of Munster	The hydrologic and hydraulic analyses for this study were performed by the USACE, Chicago District, for FEMA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 19. This study was completed in September 1978.
Town of New Chicago	The hydrologic and hydraulic analyses for this study were performed by Clyde E. Williams and

	Associates, Inc., for the FIA, under Contract No. H4013. This work, which was completed in June 1977, covered all significant flooding sources affecting the Town of New Chicago.
Town of Schererville	The hydrologic and hydraulic analyses for this study were performed by the U. S. Department of Agriculture, SCS, for the FIA, under Inter-Agency Agreement No. H-9-76, Project Order No. 9, and Inter-Agency Agreement No. H-8-77, Project Order No. 1. This study was completed in April 1978.
Town of Schneider	The hydrologic and hydraulic analyses for this study were performed by Harza Engineering Company for the FIA, under Contract No. 11-4803. This study was completed in March 1979.
Town of St. John	The hydrologic and hydraulic analyses for this study were performed by the U.S. Department of Agriculture, SCS, for the FIA, under Inter-Agency Agreement No. 11-9-76, Project Order No. 9 and H-8-77, Project Order No. 1. This study was completed in May 1978.

Flood Insurance Studies for the City of Whiting and the Town of Winfield have not been previously published.

Hydrologic and hydraulic analyses for detailed stream reaches, redelineation of effective detailed study areas, digitization of effective detailed study areas, hydrologic and hydraulic analyses for approximate stream reaches, digitization of effective approximate study areas and the conversion of the unincorporated and incorporated areas of Lake County into Countywide Format was performed by Stantec Consulting Services Inc. (Stantec) for FEMA Region V under Contract No. EMC-2001-CO-2018, Task Order No. EMC-2001-TO-06. This work was completed in PRELIMINARY.

In addition to incorporating the existing Flood Insurance Studies for communities within Lake County, this countywide FIS included incorporation of approved Letters of Map Change (LOMCs).

Digital base map files provided by the Lake County Surveyor's Office included 2003 orthophotography and 2001 topography with a contour interval of one (1) foot. The City of East Chicago provided 1998 orthophotography and 2004 topography with a contour interval of two (2) feet. The City of Hammond provided 2001 orthophotography and 2004 topography with a contour interval or two (2) feet. 2004 topographic information with a contour interval of ten (10) feet was also obtained from USGS. The coordinate system used for the production of the DFIRM is State Plane Indiana West 3851 Zone Feet, North American Datum 1983, Lambert Conformal Conic Projection. Differences in the datum and projection system used in the production of the DFIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on this DFIRM.

1.3 Coordination

The purpose of an initial Consultation and Coordination Officer (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study. The dates of the initial and final CCO meetings held for the previous FIS reports covering the incorporated and unincorporated areas of Lake County, Indiana are presented in Table 1 (References 1-18).

TABLE 1 - CCO Meeting Dates for Pre-Countywide FIS

Community Name	Initial CCO Date	Final CCO Date
Cedar Lake, Town of	*	15-April-81
Crown Point, City of	March-76	26-Sep-78
Dyer, Town of	*	15-April-81
East Chicago, City of	25-Aug-78	5-March-79
Gary, City of	5-Jan-76	10-April-80
Griffith, Town of	Dec-78	2-Dec-81
Hammond, City of	5-Jan-76	10-April-80
Highland, Town of	Dec-78	2-Dec-81
Hobart, City of	March-76	26-Oct-78
Lake County (Unincorporated Areas)	18-Dec-74	28-April-80
Lake Station, City of	March-76	10-Oct-78
Lowell, Town of	Dec-75	20-Dec-78
Merrillville, Town of	March-76	27-Nov-78
Munster, Town of	Jan-76	15-April-81
New Chicago, Town of	March-76	11-Oct-78
Schererville, Town of	Dec-75	30-Jan-79
Schneider, Town of	*	14-Aug-79
St. John, Town of	Dec-75	29-Nov-78

*No Data Available

For this countywide FIS, an initial CCO meeting was held on August 23, 2002 and attended by representatives from FEMA Region V, Indiana Department of Natural Resources (DNR), the Study Contractor and the communities. An interim CCO meeting was held on November 16, 2004 and attended by representatives from FEMA Region V, Indiana DNR, U.S. Army Corps of

Engineers, the Study Contractor and the communities. The final CCO meeting was held on PRELIMINARY and attended by representatives from FEMA, the communities, and the study contractors. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of Lake County, Indiana including the incorporated communities listed in Section 1.1.

Effective approximate study reaches were revised and new approximate studies were performed with new hydrologic and hydraulic analyses. Floodplains for these approximate stream reaches were delineated using the available topographic data.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction. Dyer Ditch, Grand Calumet River, Hart Ditch, Seberger Ditch and Turkey Creek were restudied by detailed methods as part of this mapping update. The remaining flooding sources studied previously by detailed methods were redelineated for this FIS. The limits of the flooding sources studied by detailed methods for this FIS are presented in Table 2 (References 1-18).

TABLE 2 – Flooding Sources Studied by Detailed Methods

Flooding Source	From	To
Bailey Ditch	Singleton Ditch	2,700 feet upstream of State Route 2
Bruce Ditch	Singleton Ditch	1,850 feet upstream of Parish Avenue
Bryant Ditch	Singleton Ditch	6,860 feet upstream of 173rd Avenue
Bull Run	St. John Corporate Limits	9,470 feet upstream of corporate limits
Bull Run Tributary	Bull Run	1,990 feet upstream of 101st Avenue
Burns Ditch	Corporate Limits	1.840 feet upstream of Interstate 80 and 90
Cady Marsh Ditch	Confluence with Hart Ditch	6,030 feet upstream of Whitcomb Street
Cedar Creek	Singleton Ditch	1,310 feet upstream of Binyon Avenue

TABLE 2 – Flooding Sources Studied by Detailed Methods *(continued)*

Flooding Source	From	To
Chapel Manor Lateral	Confluence with Turkey Creek	740 feet upstream of 80th Place
Deep River	Confluence with Burns Ditch	80 feet upstream of 101st

		Avenue
Deer Creek	Merrillville Corporate Limits	2,440 feet upstream of 109th Avenue
Dinwiddie Ditch	Singleton Ditch	2,440 feet upstream of State Route 2
Duck Creek	Confluence with Deep River	County boundary
Dyer Ditch	Confluence with Hart Ditch	130 feet upstream from 77th Street
Foss Ditch	Lake Dalecarlia	10,000 feet upstream of Clark Street
Grand Calumet River	Indiana State Boundary	5,770 feet upstream of Tennessee Street
Griesel Ditch	Singleton Ditch	7,000 feet upstream of 173rd Avenue
Hart Ditch	Confluence with Little Calumet River	2,400 feet upstream of Hart Street
Indiana Harbor Canal	Corporate Limits	Confluence with Grand Calumet River
Kaiser Ditch	Confluence with Turkey Creek	1,450 feet upstream of 73rd Avenue
Kankakee River	State Boundary	8,250 feet upstream of County boundary
Lake George Canal	Confluence with Indiana Harbor Canal	East Chicago corporate limits
Little Calumet River - East	Conrail	Confluence of Hart Ditch
Little Calumet River - West	State Boundary	Confluence of Hart Ditch
Main Beaver Dam Ditch	Confluence of Niles Ditch	6,320 feet upstream of Blaine Street
Main Beaver Dam Ditch Tributary BE	Main Beaver Dam Ditch	100 feet upstream of US Route 231
Main Beaver Dam Ditch Tributary BL	Main Beaver Dam Ditch	Fathke Road
Main Beaver Dam Ditch Tributary BN	Main Beaver Dam Ditch Tributary BL	117th Avenue
Main Beaver Dam Ditch Tributary BV	Main Beaver Dam Ditch	113th Avenue
Main Beaver Dam Ditch Tributary LP	Main Beaver Dam Ditch	3,000 feet upstream of Conrail
Main Beaver Dam Ditch Tributary – South	Summit Street	1,100 feet upstream of Corporate Limits
McConnell Ditch	Cedar Creek	Morse Street
Meadowland Lateral	Confluence with Turkey Creek	61st Avenue

TABLE 2 – Flooding Sources Studied by Detailed Methods *(continued)*

Flooding Source	From	To
New Elliot Tributary	Turkey Creek	Oliet Street

Niles Ditch	Deep River	2,890 feet upstream of 129th Avenue
Niles Ditch Tributary NS	Niles Ditch	1,180 feet upstream of State Route 53
Niles Ditch Tributary NT	Niles Ditch	7,600 feet upstream of mouth
Redwing Tributary	Spring Run	State Route 2
Schererville Ditch	Confluence with Dyer Ditch	1,100 feet upstream of Roman Drive
Schilling Ditch	Confluence with Dyer Ditch	700 feet upstream of 80th place
Schoon Ditch	Confluence with Hart Ditch	1,110 feet upstream of Calumet Aveune
Seberger Ditch	Schererville corporate limits	110 feet upstream of Redar Drive
Singleton Ditch	State Boundary	3,200 feet upstream of 173rd Avenue
Spring Run	Griesel Ditch	145th Avenue
Spring Street Ditch	Confluence with Cady Marsh Ditch	220 feet upstream of Highland corporate limits
Sprout Ditch	Hobart corporate limits	Cheese System railroad
Sprout Ditch Tributary SU	Sprout Ditch	2,000 feet upstream of Old Lincoln Way
Sprout Ditch Tributary SV	Sprout Ditch	4,800 feet upstream of Old Lincoln Way
St. John Ditch	West Creek	600 feet upstream of corporate limits
Stony Run	Singleton Ditch	3,700 feet upstream of Delaware Street
Stoney Run East Branch	Middle Branch Stony Run	3,120 feet upstream of conrail
Stony Run Middle Branch	Stony Run	3,200 feet upstream of 145th Avenue
Stoney Run Tributary ES	East Branch Stony Run	4,000 feet upstream of mouth
Stoney Run Tributary ET	Singleton Ditch	1,050 feet upstream of Randolph Road
Turkey Creek	Deep River	140 feet upstream of 85th Street
West Creek	Singleton Ditch	Confluence of St. John Ditch
West Creek Tributary WJ	West Creek	117th Avenue
West Creek Tributary WS	West Creek	157th Avenue
West Creek Tributary WT	West Creek	White Oak Avenue

TABLE 2 – Flooding Sources Studied by Detailed Methods *(continued)*

Flooding Source	From	To
West Creek Tributary WX	West Creek	State boundary

West Creek Tributary WY	West Creek	5,090 feet upstream of mouth
West Creek Tributary WZ	West Creek	6,150 feet upstream of Brunswick Dam

This countywide FIS also incorporates the determination of letters issued by FEMA resulting in revisions (Letter of Map Revision (LOMR)) and map amendments (Letter of Map Amendment (LOMA)). LOMAs incorporated for this study are summarized in the Summary of Map Amendment (SOMA) included in the Technical Support Data Notebook (TSDN) associated with this FIS update. Copies of the TSDN may be obtained from the Community Map Repository. Incorporated Letters of Map Change (LOMCs) are presented in Table 3.

TABLE 3 – Letters of Map Change Incorporated

Community	Flooding Source	Case No.	Date Issued	Type
City of Crown Point	Main Beaver Dam Ditch	02-05-3080P	09/24/2001	LOMR
Town of Griffith	Cady Marsh Ditch	03-05-5175P	09/25/2003	LOMR
City of Hammond	Unnamed Tributary to Lake George	04-05-A999P	12/30/2004	LOMR
Town of Highland	Little Calumet River	99-05-325P	12/27/1999	LOMR
Town of Highland	Cady Marsh Ditch	03-05-5174P	09/25/2003	LOMR
Lake County	Little Calumet River	99-05-325P	12/27/1999	LOMR
Lake County	Main Beaver Dam Ditch	02-05-3080P	04/7/2003	LOMR
Lake County	Schilling Ditch	03-05-0072P	04/28/2003	LOMR
Lake County	Cady Marsh Ditch	03-05-3366P	09/25/2003	LOMR
Lake County	Cady Marsh Ditch	03-05-5175P	09/25/2003	LOMR
Lake County	Golf Lake	05-05-A422P	06/30/2006	LOMR
Town of Schererville	Schererville Ditch	00-05-011P	01/8/2001	LOMR
Town of Schererville	Schilling Ditch	00-05-011P	01/8/2001	LOMR
Town of Schererville	Turkey Creek	01-05-757P	03/13/2001	LOMR
Town of Schererville	New Elliot Tributary	02-05-3647P	12/26/2002	LOMR
Town of St. John	Golf Lake	05-05-A422P	06/30/2006	LOMR
Town of St. John	St. John Ditch	06-05-BA28P	05/29/2007	LOMR
City of Whiting	Unnamed Tributary to Lake George	04-05-A999P	12/30/2004	LOMR

2.2 Community Description

Lake County Unincorporated Areas

Lake County is the most northwestern county in Indiana. Lake County is bounded by the State of Illinois to the west, Newton and Jasper Counties to the south, Porter County to the east, and Lake Michigan to the north. Major urban areas within Lake County include Hammond, Gary, Lake Station, and East Chicago. The total land area contained within the county is 513 square miles. According to the U.S. Census Bureau, the population of Lake County in 2007 was estimated to be 492,104 (Reference 19).

The northern part of Lake County is a prime industrial center, densely populated, and an integral part of the metropolitan Chicago industrial center. This industrial growth and development has steadily stimulated residential and commercial development in other parts of the county. The Lake County area is served by many railroads and several U.S., State, and Interstate highway systems.

The climate is characterized by moderately warm summers and cold winters. Temperatures range from above 90 degrees Fahrenheit (F.) to below 0 degrees F., with an average of 51 degrees F. Annual precipitation averages 36 inches with a major portion occurring in the spring and summer (Reference 20).

The soils in Lake County can be divided into seven soil associations. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and is named for the major soils. The soils in one association may occur in another, but in a different pattern. The following is a brief description of each of the associations in Lake County (Reference 21).

> Oakville-Tawas association: Steep to nearly level and depressional, excessively drained and very poorly drained soils that formed in coarse-textured and organic materials.
>
> Plainfield-Watseka association: Moderately sloping to nearly level, excessively drained and somewhat poorly drained soils that formed in coarse-textured glacial outwash.
>
> Maumee-Bono-Warners association: Depressional and nearly level, very poorly drained soils that formed in coarse-textured to fine- textured lake sediments.
>
> Alida-Del Rey-Whitaker association: Nearly level somewhat poorly drained, moderately coarse-textured and medium-textured soils that formed in glacial outwash and lake sediments.
>
> Morley-Blount-Pewamo association: Steep to nearly level, moderately well-drained to poorly drained soils that formed in moderately fine-textured glacial till.

Elliot-Markham-Pewano association: Nearly level and gently sloping, well—drained to poorly drained soils that formed in moderately fine textured glacial till.

Rensselaer-Gilford association: Depressional and nearly level, poorly drained and very poorly drained soils that formed in moderately fine-textured to moderately coarse textured glacial outwash.

Lake County lies wholly within three generally east-west-trending subdivisions of the landscape region: the Calumet Lacustrine plain, the Valparaiso Morainal Area, and the Kankakee Outwash and Lacustrine Plain. The Calumet Lacustrine Plain occupies the heavily populated and industrialized northern part of the county. This is an area of generally low relief that occupies the bed of glacial Lake Chicago. The Valparaiso Morainal Area is a complex system of rolling hills extending in an arc across the middle part of the county. The moraine complex has gently rolling topography in Lake County. The Kankakee Outwash and Lacustrine Plain comprises approximately the southern quarter of the county and is a large, sandy, and poorly drained plain. Most of the Valparaiso Morainal Area and the Kankakee Outwash and Lacustrine Plain of Lake County is used for agricultural production. In recent years, the population growth and outward migration has been from northern Lake County. Population predictions indicate extensive future development of the Valparaiso Morainal Area for residential and commercial uses with a subsequent decrease in agricultural use (Reference 22).

The drainage divide between the Mississippi and St. Lawrence basins crosses Lake County from east to west in a crooked line that passes to the south of Crown Point. The northern slope of the divide drains into the Calumet River and its branches, and the southern slope into the Kankakee River system. The Little Calumet River is the primary drainage channel for the Lake Michigan regional watershed. Much of the land in the northern and southern parts of the county was originally marshy, but most of these areas are now artificially drained.

Most tributary streams to the Kankakee River in Indiana are man-made channels, particularly in the downstream reaches where they discharge into the river. The larger tributaries were of natural origin with outlets to the Kankakee marsh. Most of the extensive Kankakee valley alluvial plain is drained by excavated ditches. The majority of the drainage channels in the county do not have the capacity for the larger flood flows.

Although the importance of industrial growth in the northern part of the county has far surpassed that of farming, farming has remained important to the economy of the central and southern parts of the county. Principal crops grown are corn, soybeans, and wheat. The flood plains of the unincorporated areas of Lake County are used primarily for agricultural production. Land use in the flood plain is cropland, grassland, forest land, and other land. Several residences are located in these flood prone areas.

Town of Cedar Lake

The Town of Cedar Lake is located along U.S. Route 41 in the middle of Lake County. The town lies approximately 26 miles southeast of Chicago and 15 miles south of Hammond. All of the lands adjacent to the town are part of unincorporated Lake County. Nearby communities include Lowell to the south, Crown Point to the northeast and St. John to the north. Cedar Lake, with about 8.5 miles of shoreline, occupies about one fifth of the total area of the town. The town has experienced steady growth in population. According to U.S. Census figures, the population of Cedar Lake in 2007 was estimated to be 10,634 (Reference 19). The current incorporated area of Cedar Lake is about eight square miles.

The topography of Cedar Lake is rolling. Land surface elevations within the corporate limits range from 698 feet in the southern swamp area to 773 feet near Fairbanks Street in the northeast corner of the community. The area is underlain by Silurian Age dolomite covered by glacial moraine deposits of the Pleistocene Series. The moraine deposits consist of a dense, poorly sorted mixture of clay, silt, sand, and rock fragments. The topography and soils of Cedar Lake were formed primarily by Wisconsin era glaciation. Soils are poorly drained and cause severe restrictions on development.

Cedar Creek flowing south through the southeastern portion of the community is about 1.5 miles in length with a drainage area of about eight square miles at the outlet of Cedar Lake. Development in the flood plain is limited to a few residential structures.

City of Crown Point

The City of Crown Point is the county seat of Lake County, Indiana. It is roughly 13 miles south-southwest of Gary, Indiana, and about 36 miles southeast of the downtown loop in Chicago, Illinois. Crown Point's population in 2007 was estimated to be 23,909 (Reference 19).

The City of Crown Point was founded in 1840 and immediately established as the center for local governmental activities as a result of its central location in an agricultural community. As the Gary metropolitan area, located north of Crown Point, expanded, urban development in the study area accelerated. Most of the new development though has been residential in character. This includes at least one new subdivision on the north side, west of Indiana Street and north of Merrillville Road as well as other smaller developments along the south tributary, west of the downtown region where the traditional commercial districts are situated. Like other cities and towns south of Gary, a large percentage of the population commutes to the Gary-Hammond-Chicago industrial centers. However, a few small manufacturing establishments exist adjacent to the Conrail tracks.

The study region is underlain by the Valparaiso moraine which accounts for the gently rolling topography of the area. The streams in the study region flow through forested, bush, grassy, and urban areas with the majority of the drainage area lying in pasture and farmland, with Main Beaver Dam Ditch acting as the headwater for the Deep River drainage basin.

Town of Dyer

The Town of Dyer, located in the northwestern part of Lake County, is seven miles southwest of Gary. Dyer is bordered by the Town of Munster on the north, the Town of Schererville on the east, the Village of Lynwood, Illinois, and unincorporated Cook County, Illinois on the west, and unincorporated Lake County on the south.

Present land uses in Dyer are primarily residential with some agricultural, commercial, light industrial and open space uses evident. The population in 2007 was estimated to be 15,691 (Reference 19).

The topography of Dyer is very flat with a maximum relief of approximately 25 feet within the town. The bedrock in the Little Calumet basin is of sedimentary origin, the uppermost units being comprised of limestone and dolomite of the Niagrian series, Silurian system (Reference 20). The soils in the basin are generally sands and scattered muck deposits underlain by massive glacial till sheets having a silty clay composition (Reference 21). Woodlands in the Little Calumet River basin consist of oak, willows, poplar, and cottonwood. Undeveloped lowlands are covered with swamp grass, while dry grasses cover open upland areas.

Plum Creek, with a total drainage area of 70.7 square miles, is a man-made tributary of the Little Calumet River. Plum Creek was excavated through a sand ridge and flows in a northeasterly direction from Dyer. Land use in the Plum Creek floodplain in Dyer is primarily agricultural and residential.

Dyer Ditch is also a man-made drainage ditch. It flows north and empties into Plum Creek in northern Dyer. Land use along Dyer Ditch is similar to land use along Plum Creek.

City of East Chicago

The City of East Chicago is located in the northwestern corner of Lake County. It lies 21 miles southeast of the Loop area of Chicago, Illinois. East Chicago is bordered by Lake Michigan and Whiting on the north, Hammond on the south and west, and Gary on the east. The 2007 census estimates East Chicago's population at 30,151(Reference 19). The industrial significance is greater than these figures would indicate since much of the East Chicago labor force resides in Hammond and Gary. Land use is primarily industrial and residential with a small amount of commercial and open space use evident. East Chicago is a major industrial and transportation center. Two major steel mills and several petroleum refineries comprise the northern section, southeastern section, and canal region of East Chicago. The Indiana Harbor is a major shipping facility for the Great Lakes navigational system. East Chicago is also served by several railroad lines.

In 1853, George W. Clark began buying land on the future site of East Chicago. Clark envisioned a great shipping center on this site. Twenty-two years after Clark's death, in 1888, the East Chicago Improvement Corporation began the planning of a canal between Lake Michigan and the Grand Calumet River. This was also the year that the Standard Steel and Iron Company and the William Graver Tank Works began to develop East Chicago as an industrial town. In 1893, East Chicago was incorporated as a city. Ten years later, the Indiana Harbor and Ship Canal opened, giving East Chicago the transportation facilities to make it a very desirable location for new industry.

The topography of East Chicago is very flat, with a maximum relief of 20 feet within the city. The principle physiographic features of the Little Calumet River basin resulted from the last glaciation by the Lake Michigan lobe of the Wisconsin ice sheet. Wetland areas overgrown with thick grass and low-lying brush predominated because of the limited topographic relief. These wetlands exemplified the general sluggishness of the Little Calumet River basin in discharging runoff. Most of the wetlands areas of East Chicago have been reclaimed with sand landfill.

The Little Calumet River rises in western La Porte County, Indiana, and encompasses a total drainage area of approximately 587 square miles. Originally, the entire river drained to the west, past the Illinois-Indiana state line, where it made a sharp curve to the northwest into Indiana, and eventually emptied into Lake Michigan at the present Marquette Park in Gary. About 170 years ago, the Indians opened a new channel to Lake Michigan just east of the state line. Eventually, the original mouth at Gary became clogged with vegetation and sand, causing this portion of the river, now called the Grand Calumet River, to flow westward to the new mouth. The Calumet-Sag Channel was dug in 1922, partially to prevent pollution to the lake from this reverse flow. Flows from the Little Calumet River west of Plum Creek now empty into the Calumet-Sag Channel and continue westward to the Chicago Sanitary and Ship Canal. The Indiana Harbor Canal flows north-northeast from the Grand Calumet River to Lake Michigan. Most of the Grand Calumet River to the east and a small section to the west of the canal empty into the canal. The Lake George Canal begins in Hammond and flows east to the Indiana Harbor Canal.

<u>City of Gary</u>

The City of Gary is located in the northern part of Lake County. Gary borders Lake Michigan on the north; Hammond and East Chicago on the west; Porter County on the east; and Lake Station, Hobart, Merrillville, and parts of unincorporated Lake County to the south. The 2007 census estimates the population of Gary as 96,429 (Reference 19).

In March 1906, U.S. Steel began the construction of a large steel manufacturing complex on the southern most tip of Lake Michigan. This land was an uninhabited region with swampy lowlands and sand dunes before construction began. In June, U.S. Steel organized and commissioned the Gary Land Company to lay out an "ideal individual town" and on July 17, the Town of Gary became incorporated. The building continued at an astonishing rate and by 1910, Gary was an industrial boom city with a population of 16,802. Between 1910 and

1920, the population continued to grow to 55,379. Other, primarily steel related industries continued to spring up in Gary's industrial section.

The topography of most of Gary is very flat, with a maximum relief of 35 feet. The extreme northeast corner of Gary is the exception, with hills as high as 100 feet. Because of the limited topographic relief in the Gary area, several wetland areas overgrown with thick grass and low-lying brush can be found. These wetlands exemplify the general sluggishness of the Little Calumet River basin discharging runoff.

Present land uses in Gary are primarily industrial and residential with some commercial and open space uses evident. The iron, steel, sheet, and tin plate mills and cement plants are among the largest in the world today. Other products manufactured in Gary include auto bodies and accessories, plastics, jet engines, and clothing. This manufacturing is mostly confined to the area between the Grand Calumet River and Lake Michigan. The residential areas are south of the Grand Calumet River. Most of the Little Calumet River flood plain is residential and open space area with most of the Grand Calumet River flood plain being open space. Lake Michigan does not have a significant flood plain. Gary has developed an excellent network of transportation facilities with three interstate highways, numerous railroad lines, and a deep draft harbor on Lake Michigan.

<u>Town of Griffith</u>

The Town of Griffith, Indiana is located in northern Lake County about 40 miles southeast of downtown Chicago. The Town of Griffith is bordered by the City of Gary, the Town Merrillville and unincorporated Lake County to the east, the Town of Schererville and unincorporated Lake County to the south, the Towns of Schererville and Highland to the west, and the City of Gary to the north. The Town of Griffith encompasses 7.07 square miles and had a 2007 population of 16,333 (Reference 19).

The topography of Griffith is very flat, with a maximum relief of about 25 feet within the town. South of Ridge Road, the town is virtually flat, and north of Ridge Road the land slopes gently toward the Little Calumet River. Soils in the basin are generally sands and scattered muck deposits underlain by massive glacial till sheets having a silty clay composition (Reference 22). Woodlands in the Little Calumet River basin consist of oaks, willows, poplars and cottonwoods. Undeveloped lowlands are covered with swamp grass, while dry grasses cover open upland areas.

Development within this area, including the flood plain, is primarily residential. This development could result in an increasing amount of flood damages along the streams under study.

<u>City of Hammond</u>

The City of Hammond is located in the northwest corner of Lake County. It is 19 miles south-southeast of the Chicago Loop. Hammond is bordered by Lake

Michigan on the north; Gary, East Chicago, and Whiting on the east; Highland on the south; and Chicago, Barnhart, and Calumet City, Illinois, on the west.

A community was founded at Hammond in 1851. The community was later named for George Henry Hammond who established a meat packing plant there in 1868. Hammond was incorporated in 1884. The 2007 census lists the population of Hammond as 77,175 (Reference 19). Present land uses in Hammond are primarily industrial and residential with some commercial and open space uses evident. Hammond is a major transportation center with three interstate highways and numerous railroads. Although Hammond is surrounded by huge steel plants and oil refineries, its economy depends on about 200 small industries. The principal products include books, soap, margarine, corn products, steel forgings, railroad equipment, chains, steel and fiber containers, and candy (Reference 20).

The topography of Hammond is very flat, with a maximum relief of 25 feet within the city. Because of the limited topographic relief in the Hammond area, several wetland areas overgrown with thick grass and low-lying brush can be found.

Town of Highland

The Town of Highland is located about 40 miles southeast of downtown Chicago. Bordered by the Town of Griffith to the east and south, the Town of Schererville to the south, the Town of Munster to the west and the City of Hammond to the north, the town encompasses 7.0 square miles and had a estimated 2007 population of 22,709 (Reference 19). Just south of Interstate Highway 80, the town is served by the Chessie System Conrail and U.S. Route 41.

The topography of Highland Is very flat, with a maximum relief of about 25 feet within the town. South of Ridge Road, the town is virtually flat and north of Ridge Road, the land slopes gently toward the Little Calumet River.

Developments in this area, including the flood plain, are primarily residential. Further development could result in an increasing amount of flood damages along the streams under study.

City of Hobart

The City of Hobart is located about 4 miles southeast of Gary, Indiana, and roughly 23 miles southeast of downtown Chicago. Hobart has a population of 27,830 according to the 2007 census (Reference 19). Most of the urban development in Hobart is centered around Lake George. North of the lake and extending up to Pennsylvania Street is a large residential area whose east and west limits are roughly Hobart Road and Wabash Street, respectively. The community is nearly all residential in character with a large segment of the population commuting to the Gary, Hammond, and Chicago industrial regions for work. Less than 1 percent of the corporate area would be classified in the manufacturing category; however, urbanization pressures are accelerating.

Deep River flows from the southwest side of the city into Lake George and continues in a northerly direction to the north corporate limits. Duck Creek, which flows from the southeast side into the downtown region of the city, has its confluence with Deep River immediately upstream of the Conrail Bridge. Lastly, Turkey Creek flows from the extreme southwest side of the city into the upstream portions of Lake George.

In general, the soils in Hobart consist of many variations of the silty clay loams and are poorly drained. The streams which were studied flow through forested, brush, grassy, and urban areas with the majority of the drainage area made up of pasture and farmland. Runoff has frequently been excessive because of heavy precipitation combined with the finely textured soils.

City of Lake Station

The City of Lake Station is located in the north-central part of Lake County, Indiana. It is immediately south of Gary, Indiana, and about 30 miles southeast of the Loop in downtown Chicago.

Lake Station's population in 2007 was estimated to be 13,295 (Reference 19).

The city was first given the name Lake Station in 1907 when it was incorporated as a commercial center for the local farming community in the area. During the 1920s, the town's people decided to change the municipality's name to East Gary because of the booming industrial growth taking place at that time within Gary. This name remained in official use until 1977 when public opinion favored changing it back to its original founding title of Lake Station. Today, it is comprised mostly of single-family residences with a major percentage of these homeowners commuting to the Gary-Hammond manufacturing centers for work. Commercial development in Lake Station is currently situated along DeKalb Street on the west, Central Avenue, which runs east and west, and lastly, along U. S. Route 6 south of Interstate 80-94.

Urbanization pressures will probably continue in Lake Station at a steady pace because of continued expansion of the Gary metropolitan area and because there exists within the city sizable holdings not yet fully developed. As the name implies, railroad traffic through the city is heavy, but overall switching operations are considered light.

Flood plain development exists only in the western part of the city, and can be classified as moderate-density residential.

Town of Lowell

The Town of Lowell is located in south-central Lake County. The total land area contained within the corporate boundaries is 3.4 square miles. It is approximately seven miles southwest of Crown Point, Indiana. According to U.S. Census Bureau figures, the population of Lowell is 8,290 (Reference 19).

Cedar Creek and McConnell Ditch are the main streams in Lowell. Cedar Creek, with a drainage area of 21.4 square miles at the uppermost corporate boundary, flows in a southerly direction through the center of town. The total drainage area of Cedar Creek is 31.3 square miles at its confluence with Singleton Ditch. McConnell Ditch drains the northwest portion of Lowell. It has a drainage area of 3.98 square miles at its junction with Cedar Creek just upstream of 176th Avenue. Approximately 45 percent of the land has been developed, with the remainder of the land being cropland, pasture, woodland, or other land. The flood plains include residential and commercial developments as well as the above-mentioned uses. State Route 2 is the only principal highway and the Louisville and Nashville Railroad is the only railroad serving this town.

Town of Merrillville

The Town of Merrillville is located in the eastern region of Lake County, roughly 5 miles south of Gary, Indiana, and about 33 miles southeast of the downtown loop in Chicago.

The town was incorporated on December 30, 1971. Prior to this date, it had been grouped together with two other unincorporated areas, Lottaville and Rexville. After Merrillville was incorporated, an official town census was taken in October 1973, at which time the population was 25,978. The 2007 population estimates lists the population at 32,147(Reference 19).

Economic demands to urbanize this area have increased in the past decade as the Gary metropolitan region north of Merrillville has expanded. Floodplain development, however, is a major concern since urbanization pressures will continue as the town slowly changes from an agricultural region into an urban one.

In general, the soils in Merrillville consist of many variations of the silty clay loams and can be well-drained to poorly drained. There are three major soil associations within the town: (1) Alida- Del Rey-Whitaker, (2) Marley-Blount-Pewamo, and (3) Elliott-Markani- Pewamo. All of these were formed in glacial outwash and lake sediments. Runoff can be excessive when heavy precipitation occurs on the moderately fine-textured soils.

Town of Munster

The Town of Munster is located about five miles southeast of Chicago city limits, in northwest Lake County. The west boundary of Munster is situated along the Illinois-Indiana state line. Munster is bordered by the City of Hammond to the north, the Town of Highland to the east, the Towns of Dyer and Schererville to the south, and the City of Lansing, Illinois and unincorporated Cook County, Illinois to the west. The 2007 population estimates lists the population of Munster as 22,137 (Reference 19).

The development of Munster began along Ridge Road, the main route to Chicago in the 1840's. In the mid-1800's a way station and rest house named the Brass Tavern was built along Ridge Road. During the latter part of the 19th century, Dutch-American farmers settled along Ridge Road and named their settlement Munster after Jacob Munster, one of the original settlers.

Schoon Ditch, another manmade tributary, extends from the southern end of Monroe Avenue to its mouth at Plum Creek. The ditch's drainage area is 1.8 square miles. Schoon Ditch's flood plain is, for the most part, contained within the stream's banks, and contains only minor portions of residential properties and a power easement.

Town of New Chicago

The Town of New Chicago is located in the north-central part of Lake County, Indiana. It is about 4-1/2 miles southeast of Gary, Indiana, and about 31 miles southeast of the Loop in downtown Chicago. It is bordered by the Cities of Hobart and Lake Station, Indiana.

New Chicago's population in 2007 was estimated to be 2,001 (Reference 19).

The town was first incorporated in 1896 as a commercial center for the local agricultural community. Today, it is comprised almost entirely of single-family residences with a significant percentage of these homeowners commuting to the Gary-Hammond industrial centers for work. Commercial development in New Chicago is presently concentrated along Michigan Street, Humer Avenue, and 37th Avenue urbanized except for the stream banks and the flood plain, which are forested parkland.

Town of Schererville

The Town of Schererville is located in northwest Lake County. The total land area contained within the corporate boundaries is 8.33 square miles. It is approximately five miles south of Hammond, Indiana, and seven miles northwest of Crown Point, Indiana. Dyer, Munster, Highland, and Griffith, Indiana, have common corporate boundaries with Schererville. According to U. S. Census Bureau figures, the population of 2007 was estimated to be 28,798 (Reference 19).

The vegetative cover within the floodplain is primarily herbaceous. The town has very flat topography which causes extensive drainage problems, especially in the northern sections.

Schererville Ditch and Schilling Ditch, with respective drainage areas of 1.85 square miles and 3.10 square miles, flow in a northwesterly direction across the southwest portion of Schererville and outlet into Dyer Ditch near the Dyer-Schererville corporate boundary. Dyer Ditch flows in a northerly direction along the western corporate boundary. Seberger Ditch, with a drainage area of 3.6 square miles at the Munster-Schererville corporate boundary, flows in a northerly direction and becomes known as the Spring Street Ditch when it enters Munster, Indiana. Turkey Creek drains the southeastern portion of Schererville and flows east across Lake County, outletting into Lake George. The drainage area of Turkey Creek at the corporate boundary is 4.92 square miles.

Approximately 40 percent of the land has been developed with the remainder of the land being cropland, pasture, woodland, or other land. The flood plain is approximately 10 percent residential, commercial, and industrial developments with the remainder being cropland, woodland, pasture, and other land. U. S. Routes 41 and 30 are the principle highways. Railroads serving the area are Conrail and the Elgin, Joliet and Eastern Railroad.

Town of Schneider

The Town of Schneider is located on U.S. Route 41 approximately 1.0 mile north of the county line in southwestern Lake County. The town lies approximately 40 miles southeast of Chicago and 29 miles south of Hammond. All of the lands adjacent to the town are part of unincorporated Lake County. Schneider has experienced steady growth in population, according to U.S. Census Bureau figures. The population of Schneider in 2007 was estimated to be 298 (Reference 19). The current incorporated area of Schneider is 1.0 square mile.

The topography of Schneider is very flat. Land surface elevations within the corporate limits range from 628 feet to 637 feet. The area is underlain by Silurian Age dolomite covered by glacial moraine deposits of the Pleistocene Series. The moraine deposits consist of a dense, poorly sorted mixture of clay, silt, sand, and rock fragments. Schneider's topography and soils were formed primarily by Wisconsin era glaciation. Soils are poorly drained and cause severe restrictions on development (Reference 21).

The Kankakee River flows westward about 2,000 feet south of the Schneider corporate limits. Three excavated drainage ditches, of which Singleton Ditch to the northwest of the town is the largest, serve the Town of Schneider and adjoining areas. The ditches are located outside of the developed portion of the town and serve principally as drainage for agricultural land. The floodplain in Schneider consists of some residential development in the southern portion of the town and farmland in the northern portion of the town.

Town of St. John

The Town of St. John is located in the northwest portion of Lake County. The total land area contained within the corporate boundaries is 5.3 square miles. It is approximately five miles northwest of Crown Point, Indiana. According to U.S. Census Bureau figures, the population was estimated to be 12,302 in 2007 (Reference 19).

Soils are primarily composed of the Morley-Blount-Pewano associations which have good drainage characteristics and a moderately fine texture (Reference 21).

West Creek, Bull Run, and St. John Ditch are the main streams in St. John. Bull Run, with a drainage area of 5.5 square miles, flows for approximately 1.5 miles through the southwest portion of St. John. St. John Ditch, with a drainage area of 1.2 square miles, flows for approximately 1.8 miles, draining the southeast portion of the town. The two streams join near the south corporate boundary to form West Creek. West Creek, with a total drainage area of 55.1 square miles, flows in a southerly direction for about 0.4 mile to the corporate boundary and continues its southerly flow near the Indiana-Illinois state line to its confluence with Singleton Ditch in southwest Lake County.

Approximately 40 percent of the land has been developed, with the remainder of the land being cropland, pasture, woodland, or other land. The flood plains include residential developments as well as the aforementioned uses. The principle highway is U.S. Highway 41 and the Louisville and Nashville Railroad and Conrail serve this town.

2.3 Principal Flood Problems

The flood season in Lake County and Incorporated Areas generally extends from winter through spring. Floods are caused by excessive rainfalls or a combination of rainfall and snowmelt. Ice jams have been the cause of unusually high stages as have debris accumulations.

In many areas, flood levels have been increasing because of recent urbanization near some of the watercourses which results in greater runoff into streams. Urbanization is often accompanied by filling in the flood plain or by encroachment upon it which reduces channel conveyance capacity. Increased floods on the main channels cause backwater effects on their tributaries. Additional flood runoff is unable to flow through restricted culverts and bridge openings which often are clogged with sediment and debris from new construction. The problems associated with urbanization are further complicated by inadequate channel improvements.

Lake County Unincorporated Areas

Significant flooding occurred in January 1973, May 1975, and April 1978. An estimated 64,000 acres of productive farmland were flooded in the April 1978 flood due to a break in the Kankakee River spoil bank near Shelby, Indiana. At the same time, another break in the spoil bank near Schneider, Indiana, created an estimated $750,000 in damage (Reference 23). Approximately 140 persons were evacuated in Schneider during this flood (Reference 24). The USGS stream gage on the Kankakee River at Shelby, Indiana (No. 05518000) recorded a maximum flow of 5,430 cubic feet per second (cfs) during this flood. This was approximately a 10-percent frequency flow at that gage. Floods along the Kankakee River are of long duration and this extended period of high water also causes drainage problems due to the water table rising to near or even above the ground surface.

Town of Cedar Lake

Principal flood problems in the Town of Cedar Lake are due to overbank flooding from Cedar Creek. The flood season generally extends from winter through spring. No dollar estimates of historic flood damages are available. The water level of Cedar Lake is recorded daily at midnight by a water level recorder at the outlet of the lake near Binyon Road. These records are not adequate to determine historic flood discharges or the recurrence interval of the historic floods experienced by the residents.

City of Crown Point

Flooding has occurred in the Main Beaver Dam Ditch watershed (a tributary of Deep River) for over a decade, but comprehensive solutions have not yet been applied. For instance, several small urban developments in the past have been built within the flood plain. Fortunately, most of the flood plain is reserved for crops, pasture, and woodlands.

Natural and man-made obstructions to flood flows need to be closely monitored since backwater and increased flood heights upstream as well as high flood flow velocities downstream present many dangers. In addition, accumulation of debris in streambeds and around bridge and culvert openings impedes flood flow, where flooding occurred due to the backup of a tributary of Deep River. Overall, Main Beaver Dam Ditch and its south tributary have 12 bridges or culvert openings which would obstruct flood flows. Several of these bridges are inundated by the 1-percent annual chance flood event. Major areas which have been flooded in the past will continue to be flooded in the future if flood reduction structures are not built. The following areas are included:

(a) Parts of the subdivision located between Indiana Street and State Route 55 on the north side of Main Beaver Dam Ditch.

(b) Madison Street at 101st Street.

(c) The South Tributary to Main Beaver Dam Ditch at the east end of Summit Street.

(d) Wirtz Road bridge north of Farragut.

(e) Pratt Street bridge north of Monitor Street.

City of Dyer

Flooding in Dyer has occurred mainly in residential, agricultural, and undeveloped areas. Significant property damage has resulted from floods in 1943, 1944, 1954, 1957, 1959, and 1965.

In 1959, floodwaters forced more than 24 families from their homes in the wealthiest residential section of Dyer, west of Hart Street and south of Hart Ditch (Reference 40). Cars were stranded so residents had to be evacuated with fire department trucks. A subbasement was flooded at Our Lady of Mercy Hospital.
Major floods have occurred in the Dyer area during all seasons of the year. Flood flow stages can rise from normal flow to extreme flood peaks in a relatively short period of time with high velocities in the main channel of the streams.

City of East Chicago

East Chicago does not have an extensive flooding problem. High water levels on the Indiana Harbor Canal and the Lake George Canal are controlled by the high water levels on Lake Michigan. The flood stages on Lake Michigan are caused by a combination of high lake levels and the wind setup effect. Nearly all of the landfill which lies along Lake Michigan and these canals has an elevation higher than that of the 1-percent annual chance flood. Most of the flow in the Grand Calumet River is industrial cooling and process water and waste treatment plant effluents. Flooding caused by snowmelt and rainwater runoff is largely confined to undeveloped swamp lands.

City of Gary

The Little Calumet River, the main source of flooding problems in Gary, is subject to floods as a result of heavy runoffs on its tributaries. Snowmelt over the basin in the spring causes the streams to rise and the flat low-lying portions of the Little Calumet River valley are flooded for several days or, in some instances, even weeks. Prolonged flood duration is also caused by temporary storage. Major floods have occurred in March 1908, March 1944, April 1947, March 1948, May 1948, October 1954, and July 1957. Lesser floods have occurred in 68 other instances since 1907. Flooding from Lake Michigan is caused by a combination of high lake levels and wind setup effect. The Grand Calumet River does not have a major flooding problem since most of flow in the river is industrial cooling and processing water and waste treatment plant effluents.

The flood problems in the Little Calumet River basin arise form both stream overflow and from inadequate storm drainage systems. The damage due to the latter condition can be corrected only by major reconstruction of existing storm drains, the installation of sump pumps in individual basements, and extensions of storm drains to those areas which now have none. The flood problem is complicated by the extreme flatness of the area causing sluggish passage of floodwaters. The large amount of development in this basin has left little space for the construction of flood protective works. This development has also increased the amount of hard surface area, such as roads, sidewalks, roofs, etc., causing greater runoff. Channel constrictions, such as bridges with insufficient floodway area, collect debris and inhibit the passage of floodwaters. Another problem is created by levees which were built without allowing sufficient channel capacities. These increase the flood stages.

Town of Griffith

Floods have occurred in the study reaches of the Little Calumet River basin and its tributaries during all seasons of the year. Floods causing significant damage have occurred in October 1954, July 1957, April 1959, December 1965 and August 1972.

City of Hammond

The Little Calumet River, the major source of flooding in Hammond, is subject to floods as a result of heavy runoff from its tributaries. Snowmelt over the basin in the spring causes the streams to rise, and the flat, low-lying portions of the Little Calumet River Valley are flooded for several days or, in some instances, for weeks. Prolonged flood duration is also caused by inadequate channel capacity which forces most of the water into temporary storage. Major floods have occurred in March 1908, March 1944, April 1947, March 1948, May 1948, October 1954, and July 1957. Lesser floods have occurred in 68 other instances since 1907. No flood recurrence intervals are available.

Flooding from Lake Michigan is caused by a combination of high lake levels and the wind setup effect. The Grand Calumet River does not have a major flooding problem because most of the flow in the river is industrial cooling and process water and waste treatment plant effluents.

Past floods in Hammond have caused extensive damage to residential, commercial, and public properties. These damages include foundation and basement damage due to hydraulic pressures and settling, deposition of debris, silt, and slime, and water damage to buildings, contents, and grounds. A health hazard is created by the backup of sanitary sewers. Hazard to life is minimal since flooding is shallow, although failure of a large spoil bank could catch people off guard and prove disastrous. In October 1954 National Guard Troops were called into Hammond to aid volunteers in the flood relief effort. The Little Calumet River broke through a sandbag dike in three places. About 400 residents of the Schleicher addition were evacuated. Total damages from this flood were estimated at $2,320,000.00 (Reference 41). The flood problems in the Little Calumet River basin arise from both stream overflow and inadequate storm drainage systems. The damage due to the latter condition can be corrected only by major reconstruction of existing storm drains, the installation of sump pumps in individual basements, and extensions of storm drains to those areas which now do not have any. The flood problem is complicated by the extreme flatness of the area causing sluggish passage of floodwaters. The large amount of development in this basin has left little space for the construction of flood protective works. This development has also increased the amount of hard surface area, such as roads, sidewalks, and roofs, causing greater storm runoff. Channel constrictions, such as bridges with insufficient floodway area, collect debris and inhibit the passage of floodwaters. Another problem is created by spoil banks which were built without allowing sufficient channel capacities resulting in increased flood stages.

Town of Highland

Floods have occurred in the study reaches of the Little Calumet River basin and its tributaries during all seasons of the year. Floods causing significant damage occurred in October 1954, July 1957, April 1959, December 1965 and August 1972. Flooding has usually resulted from heavy thunderstorms following a period of prolonged rainfall that saturated the ground or from a severe storm during snowmelt conditions.

City of Hobart

Flooding has occurred in the Deep River-Turkey Creek watershed for over a decade, but comprehensive solutions have not been applied. For instance, several small urban developments in the past have been built within the flood plain around Lake George. Fortunately, though, most of the flood plain use is reserved for crops, pasture, and woodlands.

Natural and man-made obstructions to flood flows need to be closely regulated since backwater effects and increased flood heights upstream as well as higher flood-flow velocities downstream present many dangers. In addition to permanent and topographical obstructions, accumulation of debris in the streambeds and around bridge and culvert openings also impedes flood flows, resulting in overbank flows, thus making it difficult to predict areas of flooding. Overall, Deep River, Turkey Creek, and Duck Creek have almost 20 bridges or culvert openings which could obstruct flood flows.

The one major obstruction in Deep River during floods of large magnitude is that water will back up behind the Conrail railroad bridge and inundate the Hobart Dam. The dam itself has little flood control capacity. During the May 1970 flood, gravel was dumped on the dam to help stabilize its foundations from failure. Flooding conditions have also resulted in the closing of Wisconsin Street between 3rd and 8th Streets, Rand Street between North Lake Park and Kelly Streets, Liverpool Road between 57th and Brookview, and the alley along the lakefront between Front and 3rd Streets. In 1970, a cave-in on Pennsylvania Street north of 8th Street made it partially impassable. Major floods occurred in 1954 and 1970. The October 1954 flood (3-percent recurrence interval) caused approximately $100,000 in damages, and the May 1970 flood (10-percent recurrence interval) caused approximately $10,000 in damages.

<u>City of Lake Station</u>

Flooding has occurred in the Burns Ditch-Deep River watershed for over a decade, but comprehensive solutions have not yet been applied. For instance, several small urban developments in the past have been built within the flood plain. Fortunately, any further development in the flood plain is now discouraged by the current administration.

Minor flooding occurred on the Deep River in 1937, and 1959, but the last major flood, with a 3-percent recurrence interval , occurred in October 1954. Damage from this flood was due mainly to basement flooding, but the Grand Boulevard bridge was flooded (Reference 42).

<u>Town of Lowell</u>

Flooding is limited generally to the flood plains of Cedar Creek and McConnel Ditch. There is a low wetland area east of Burr Street and the Redwing Lake area that experiences flooding from excessive rainfall.

Major floods in the Lake County area occurred in 1957, 1959, 1965, 1973, 1974, and 1975. Among these, May 1974 and June 1975 were the highest of record on Singleton Ditch which has Cedar Creek as a tributary. The frequency for the May 1974 and June 1975 floods approached the 10-percent recurrence; however, there are no streamflow records for any of the streams in the study area.

Town of Merrillville

Damaging floods have occurred in the Deep River-Turkey Creek watershed for over a decade, but comprehensive solutions have not always been applied. Flooding in the past has occurred along the Chapel Manor Lateral upstream of the 68th Avenue Bridge, at 73rd Avenue just east of the Madison Street intersection and, lastly, in the far upstream portions of the ditch around 78th Place. Efforts to minimize flooding upstream of 68th Avenue have been made; a stream canalization project has recently been finished from the mouth of the lateral at Turkey Creek up to the bridge itself. Similarly, flooding has been minimized along the overbank areas near 78th Place ever since a retention basin was dredged out of the swampy region at the headwaters of the lateral. The headwaters are located south of 78th Lane and north of U.S. Route 30. Flooding problems also existed along the Meadowdale Lateral upstream of the culvert underneath the Grand Trunk Western Railroad. A storm water detention basin farther upstream of the lateral just north of 53rd Avenue provides 100 acre-feet of storage capacity. The storm water detention basin has little effect on the Meadowdale Lateral calculated discharges since the limit of detailed study ends at 61st Avenue. Deep River, Turkey Creek, and Kaiser Ditch experience only minor flooding at this time. This is primarily because most of the flood plain is used for crops, pasture, and woodlands. Major floods occurred in October 1954 (3-percent recurrence interval) and in May 1970 (10-percent recurrence interval). Damage from both these floods was minimal.

Town of Munster

The primary cause of flooding in Munster is the Little Calumet River, although flooding can also result from Hart Ditch. Major floods along the Little Calumet River in Munster have occurred in March 1908, March 1944, April 1947, March 1948, May 1948, October 1954, July 1957, December 1965, and August 1972. A past report (Reference 44) indicates that between 1907 and 1965, 68 other instances of flooding along the Little Calumet River were recorded. This indicates an average of about one flood every 10 months.

Both the stages and damages associated with flooding from the Little Calumet River have been increased due to development of its flood plain. This development has had the following effects on flooding problems:

(1) The amount of runoff has been increased due to increased impervious area;

(2) flood stages are increased by these developments since they occupy space previously used for storage of floodwaters; and

(3) levees built to reduce flood damages to these areas further increase flood stages upstream by reducing storage and channel carrying capacity.

In Munster, virtually the entire flood plain of the Little Calumet River has been developed, primarily with residential uses.

Along Hart Ditch, some flooding is experienced in south Munster, although most of the flooding from Hart Ditch is experienced farther upstream, in Dyer. Floods causing significant damage along Hart Ditch have occurred in October 1954, July 1957, April 1959, December 1965, and December 1972. Flooding along Hart Ditch is aggravated by trees, brush, and other vegetation growing along the channel side slopes, and fallen debris collected in the channel. Besides impeding flow, this vegetation can be washed away during periods of high flow and collect at bridges causing further increases in flood heights.

Town of Schererville

Major floods have occurred in Schererville and surrounding communities during all seasons of the year. Flood flows reach their peak stages in relatively short periods of time. Generally, floods are caused by excessive amounts of rainfall. In addition, large flows have resulted from a combination of rainfall and snowmelt creating large amounts of runoff. Ice jams and debris intensify the flooding by obstructing small culverts. Although floods causing significant damage in the Lake County area occurred in 1954, 1957, 1959, 1965, and 1973, there was no appreciable amount of damage reported within the corporate limits of Schererville. Among these floods, those of October 1954 and April 1959 were the highest of record on Hart Ditch, which has Schererville Ditch, Seberger Ditch, and Schilling Ditch as tributaries (Reference 40).

There are no streamflow records for any of the study streams within the corporate limits of Schererville. However, the October 1954 and April 1959 floods approached the 4-percent frequency flow on Hart Ditch at the USGS Gage at Munster, Indiana (no. 05536195), where records have been maintained since 1944.

Flooding on Schererville Ditch and Shilling Ditch is often elevated by flooding from Dyer Ditch backwater. The Elgin, Joliet and Eastern Railroad bridge over Dyer Ditch further complicates the flood problems in this area by its restrictive flow. The 1-percent annual chance flood will require approximately 1.5 feet of head at this bridge. This backwater will flood most of an area between the railroad, U.S. Route 41, and U. S. Route 30.

Most of the study area is characterized by flat topography. During large floods, water will overtop the streambanks and inundate much of the flat flood plain area. There are several areas within Schererville where shallow flooding is created by trapped and ponded water. This is a result of inadequate drainage outlets due to the flatness of the topography.

Town of Schneider

Principal flood problems in the Town of Schneider are caused by overbank flooding from the Kankakee River. Flood damages include agricultural, residential, and commercial damages, and traffic disruption. The flood season generally extends from winter through spring. Floods are caused by excessive rainfalls or the combination of rainfall and snowmelt. Spoil bank levees were erected during the construction of Dike Ditch along the north bank of the Kankakee River. However, these levees where not properly designed or maintained. Large floods will breach the levees at weak points and inundate the flood plain (Reference 43).

Significant flooding occurred in April 1978 when a break in the spoil bank along the Kankakee River near Schneider led to an estimated $750,000 in flood damages (Reference 23). Approximately 140 persons were evacuated from Schneider during this flood (Reference 24). The U.S. Geological Survey (USGS) stream gage on the Kankakee River at Shelby (no. 05518000) recorded a maximum flow of 5,430 cubic feet per second (cfs) during this flood. This was approximately a 10-percent frequency flow at that gage. The Shelby gage is located about 5 miles upstream of Schneider. Floods along the Kankakee River are of long duration. These extended periods of high water cause drainage problems as the water table rises to the ground surface. Historic floods recorded at the Shelby gage and their approximate recurrence intervals are shown below.

TABLE 4 – Historic Floods on Kankakee River at Shelby

Flood	Peak Discharge	Percent Annual Chance Flood
1927	7,200	1
1978	5,430	10
1976	5,180	14
1959	5,100	14

The Kankakee River basin report notes that Singleton Ditch overflows twice a year on the average (Reference 43). Flooding on Singleton Ditch and the other drainage ditches near Schneider is caused by backwater from the Kankakee River.

Town of St. John

Flooding is limited generally to the flood plains of West Creek, Bull Run, and St. John Ditch. The Louisville and Nashville Railroad and Conrail bridges over St. John Ditch do restrict high flows and intensify the flooding above these bridges. Low wetland areas experience flooding from excessive rainfall and inadequate drainage outlets.

Major floods along West Creek occurred in 1954, 1966, 1967, 1968, and 1970. The October 1954 flood registered 1840 cubic feet per second (cfs) at the USGS gage, no. 05519500 near Schneider, Indiana, which is about 18 miles downstream of St. John (Reference 45). This flow approached the 4-percent frequency for that gage. This gage was discontinued in 1972. There are no other stream flow records for the streams in the study area.

2.4 Flood Protection Measures

There are no structural flood protection measures for the Town of Cedar Lake, City of Dyer, Town of Lowell, Town of Merrillville, Town of New Chicago, Town of Schererville, Town of Schneider, or Town of St. John.

The 1945 Flood Control Act as amended (Indiana Revised Code, Code Citation IC1971 13-2-22) requires that the Indiana Department of Natural Resources approve all construction in the floodway, where the floodway is defined as the channel and overbank area that is required to carry flood flows. This act applies to stream drainage areas as small as one square mile in an urban area.

Lake County Unincorporated Areas

The Lake County Surveyor's Office reviews the engineering aspects of projects that require zoning approval or a building permit. As part of this review, a criterion for runoff retention is applied. This criterion requires that the volume of flow of storm water entering a watercourse after the improvement is in place should be equal to, or less than, the volume of flow of storm water that entered the watercourse prior to development" (Reference 25).

In 1959, the SCS developed a watershed plan for West Creek under the authority of the Watershed Protection and Flood Prevention Act (PL-83¬566). Channel improvement was planned on West Creek and Bull Run. This project was authorized for construction in December 1959. However, none of the structural measures were installed and the project was placed on the inactive list in March 1968 and has since been closed out (Reference 26).

Flood protection along the Kankakee River in south Lake County is by levees constructed many years ago. Actually, the so-called levees are spoil banks created by construction of a dike ditch along the north bank of the Kankakee River. These spoil banks have little uniformity in cross section and very little maintenance. Flood damage occurs in this area when the levee breaches at a weak or low point. This is an unpredictable type of flooding (Reference 27). The Kankakee River Basin, Indiana, Report on the Water and Related Land Resources recommended 49 miles of wide levees (with no channel work) along the Kankakee River from U.S. Route 30 to U.S. Route 41 for flood prevention and drainage (Reference 27). Approximately 14 miles of these levees would be in Lake County. Also recommended was channel work on 13 selected tributaries of the Kankakee River in Indiana for flood prevention and drainage. This included 56.4 miles of channel improvement on Singleton Ditch and its tributaries in Lake County. The effects of work stemming from these two recommendations were not considered in performing this Flood Insurance Study as no construction has been authorized. Recommendations also included adopting or amending flood plain zoning ordinances, building codes, arid similar regulations for all identified flood prone areas in the basin, and allow eligibility for flood insurance.

City of Crown Point

Demand to develop more of Crown Point has increased in recent years as the Gary metropolitan area has expanded. Even though development in the flood plain is not extensive at this time, future construction in the area is of major concern. To aid in the establishment of a floodplain management program, the Lake County Surveyor's Office has implemented a policy which requires developers to allow only as much surface water runoff under improved conditions as had existed under the previous natural conditions. Also, the City of Crown Point has adopted a model zoning ordinance, which the FIA recommends to municipalities who wish to institute flood plain management criteria in their jurisdictions. Currently, there are no special projects for flood damage reduction being planned.

City of Gary

The construction of Burns Ditch and Waterway was completed in 1926 at a cost of about $1,000,000. Burns Waterway provides an outlet from the Little Calumet River to Lake Michigan about 10 miles east of Gary. Burns Ditch extends approximately west in the course of the Little Calumet River from Burns Waterway to Deep River, and the Salt Creek Arm continues east of the waterway. Burns Ditch and Waterway were later re-dredged at a cost of $75,000 by the City of Gary and adjoining communities.

Under the Works Projects Administration (WPA) projects sponsored by Gary and Hammond, in Indiana, and the Illinois Division of Waterways from 1933 to 1936, the Little Calumet River was cleaned, deepened, and widened. Numerous reaches of levees have been constructed. In general, such levees are of inadequate cross section and afford protection against only lesser floods.

Towns of Griffith and Munster

Several projects have been performed along the Little Calumet River by state and local governments in order to alleviate flooding problems. Burns Ditch and Burns Waterway were completed in 1926 with the latter providing an outlet to Lake Michigan about 10 miles east of Gary. Burns Ditch extends west approximately in the original course of the Little Calumet River from Burns Waterway to Deep River. Burns Ditch and Burns Waterway have since been dredged by the City of Gary and adjoining communities.

Munster has constructed a levee along its portions of the Little Calument River. In general, the levees along the Little Calumet River are of inadequate cross section to provide sufficient protection from a 1-percetn annual chance flood.

A Section 205 study (Reference 46) was conducted by the Chicago District COE for Cady Marsh Ditch. The information developed during the study indicated that the hydrologic criteria of 800 cubic feet per second (cfs) discharge for a 10-percent chance flood cannot be met for Cady Marsh Ditch. Thus, the improvements initially studied for this stream are excluded from further consideration under current Federal flood control authorities administered by the COE.

Griffith officials have enacted an ordinance providing for the control of floods within the town boundaries (Reference 47). This ordinance requires that new residential construction and substantial improvement of any residential structure to elevate the lowest floor, including basement, two feet above base flood elevation. The ordinance also requires all nonresidential structures to be elevated two feet above base flood elevation or be satisfactorily flood-proofed.

City of Hammond

Measures have been taken to decrease future flood losses in Hammond. Between 1933 and 1936, a Works Progress Administration project sponsored by Gary and Hammond cleaned, deepened, and widened the Little Calumet River. In 1943, the Little Calumet River Drainage Association spent $50,000 for further enlargement of the river channel between Indianapolis Boulevard and the Illinois-Indiana state line and the construction of a relief outlet channel for Hart Ditch. In 1948, the Hammond Sanitary District modernized pumping facilities at seven storm sewer outfalls to the Little Calumet River and constructed a levee-like system along the banks at a cost of $330,000. Numerous small spoil banks have been built at various times, though such spoil banks usually afford protection against only lesser floods. In addition, there are also unauthorized and private spoil bank constructions that are too numerous to locate to determine their effects during a flood event. The zoning ordinance of the City of Hammond allows open area use such as agriculture, public parks, playgrounds, and recreation areas in the flood prone areas. Single family residences are permitted on the condition that the owner provides a system of adequate flood protective works approved by the City of Hammond and the Indiana Flood Control and Water Resources Commission, Hammond Ordinance Number 2992 concerning Subdividing Real Property which requires the minimum elevation of residential streets to be 596 feet. Sites for residential structures must be one foot above curb level.

Town of Highland

Several projects were initiated along the Little Calumet River by state and local governments in order to alleviate flooding problems. Burns Ditch and Burns Waterway were completed in 1926 with the latter providing an outlet to Lake Michigan about 10 miles east of Gary. Burns Ditch extends west approximately in the original course of the Little Calumet River from Burns Waterway to Deep River. Burns Ditch and Burns Waterway have since been dredged by the City of Gary and adjoining communities.

Highland has constructed a levee along its portion of the Little Calumet River. In general, the levees along the Little Calumet River are of inadequate cross section to provide sufficient protection from a 1-percent annual chance flood.

Highland officials have enacted a zoning ordinance which requires that new residential construction and substantial improvement of any residential structure must elevate the lowest floor, including basement, 2 feet above base flood elevation (Reference 48). The ordinance also requires all nonresidential structures to be elevated 2 feet above base flood elevation or be satisfactorily flood-proofed.

City of Hobart

Demand to urbanize more of the Hobart area has increased in recent years as the Gary metropolitan region north of Hobart has expanded. Thus, even though developments in the floodplain are not extensive at this time, floodplain development is a major concern. To aid in establishing a floodplain management program, the Lake County Surveyor's Office has implemented a policy of requiring developers to allow only as much surface-water runoff under improved conditions as had existed under the previous natural conditions. Also, the City of Hobart has adopted a model zoning ordinance which the FIA recommends to municipalities who wish to institute flood plain management criteria in their jurisdictions.

Currently, there are no special projects for flood damage reduction in place, since the agricultural nature of the area had-made such projects unnecessary in the past. Hobart Dam, which is used to create Lake George, serves only as a recreational ponding source and is not considered a flood protection structure.

City of Lake Station

Currently, there are several flood control levees that have been built along Burns Ditch that begin east of Interstate 65 and continue past the eastern corporate limits of Lake Station. In these levees, there are openings at various locations which will admit floodwaters through them when the river has exceeded a certain flood stage elevation. Temporary flood storage takes place in the open spaces between these dikes and the embankments constructed for Interstates 65, 80, and 94 and also the East-West Toll Road. There are no flood control structures to protect the western sections of the city that would be inundated by the 1-perecent annual chance flood nor are any projects planned in the near future. Rather, the city intends to implement the model flood plain zoning ordinance proposed by the FIA which basically uses the flood insurance program itself as the mainstay of flood protection for the community.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the Lake County, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one (1) year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent annual chance flood in any 50-year period is approximately 40-percent (4 in 10); for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

For the new and revised approximate studies included in this updated FIS, 1-percent annual chance discharges were calculated using drainage area-discharge curves provided by IDNR.

For the new detailed studies for Dyer Ditch, Grand Calumet River, Hart Ditch, Seberger Ditch and Turkey Creek, discharges for the 10-, 2-, 1- and 0.2-percent annual chance floods were obtained from the effective detailed study models, approved LOMRs and drainage area-discharge curves provided by IDNR.

In a study entitled "Revised Report on Great Lakes Open-Coast Flood Levels" prepared by the USACE, Detroit Division, flood elevations for Lake Michigan were prepared for the 10-, 2-, 1-, and 0.2-percent annual chance flood events (Reference 35). Using recorded gage levels along Lake Michigan, frequency curves were developed to identify flood levels for the desired frequencies.

The following section is a compilation of previously published hydrologic information from earlier FIS reports where streams were studied in detail.

Pre-Countywide Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

By an Inter-Agency Memorandum of Understanding dated May 6, 1976, the water resources agencies within Indiana, namely the IDNR, the USGS, the COE, and the SCS, agreed to coordinate peak flood discharge values for planning and regulatory studies on Indiana streams.

The SCS proposed discharge-frequency relationships for all the streams studied. These data were based upon: regionalized formula (Reference 26), published discharge-drainage area data (References 22 and 27), and data developed during the Kankakee River Basin Study (Reference 28). These discharge-frequency relationships were modified during the coordination based upon computer modeling of the Hart and Dyer Ditch tributaries and Turkey Creek and tributaries, using the COE HEC-1 program (Reference 28).

The hydrology for the Indiana Harbor Canal, the Lake George Canal, and the Grand Calumet River is affected by many complicating factors, such as (1) interbasin flow, (2) the transfer of industrial process water from Lake Michigan to the canals, and (3) combined storm sewer outflows which redirect, store, and limit contributing flows. The HEC-1 computer model was considered the most reasonable method for the development of basin hydrology under these conditions (Reference 28).

The Indiana Harbor Canal basin was divided into seven sub areas for the HEC-1 model. Clark's unit hydrograph parameters were developed for the seven sub areas. Eighteen outfalls that discharge industrial process wastewater directly into the canal were included in the model. Storm outflows are limited by the carrying capacity of the outfalls.

Maximum outflows were incorporated into the model by simulating storage of excess water in each of the sub areas through the modified Puls method (Reference 28). General channel routing was accomplished by use of the Muskingum coefficient method.

The "stream system" procedure of Addendum 2 of the HEC-1 users manual was used with 10-, 50-, 100-, and 500-year rainfall distribution derived from the Weather Bureau Technical Paper No. 40 (TP-40) (References 30 and 31). The 500-year precipitation values were obtained by extrapolation on log- probability paper of the more frequent events for the 1.0 hour and longer durations of TP-40. Five stream system index drainage areas of 0.3, 4, 10, 20, and 35 square miles were selected. An initial loss of 1.0 inch and a uniform loss of 0.1 inch per hour were adopted for all sub areas.

The Grand Calumet River, between the Indiana Harbor Canal and Columbia Avenue in Hammond, has such a level slope that the direction of flow varies with flooding conditions. This condition makes peak flows indeterminate. Storage volume was computed with outlets at both ends of this part of the river.

A USGS gaging station was the principal source of data for defining discharge-frequency relationships for the Deep River drainage basin (Reference 32). This gage is located 400 feet downstream of the Hobart Dam at Ridge Road in Hobart, approximately five miles upstream from the eastern corporate limit of New Chicago, and has been recording there since July 1955. Before that, it had been located immediately upstream of the dam, and had been in operation since April 1947. Values of the 10-, 2-, 1- and 0.2-percent annual chance peak discharges were obtained from a log-Pearson Type III analysis of annual peak flow data (Reference 33). In order to provide greater definition in the discharge-frequency relationship, the COE HEC-l and HEC-2 stream modeling computer programs were used (References 5 and 6). The HEC-2 step-backwater program was run with several discharge values as input data and the results were used to generate a channel-bank storage versus discharge curve. By using time of concentration values and channel-bank storage values from the output of the HEC-2 program and hourly rainfall data for the l-percent annual chance flood, a hydrograph was developed for the stream. The hydrograph for Deep River was then compared with the log-Pearson Type III analysis which had previously been performed. Calibrations and adjustments were made to the HEC-l computer model in order to match the log-Pearson Type III analysis.

Peak Discharges for the 10-, 2-, 1- and 0.2-percent annual chance floods of the rivers and streams studied in detail through out the county, are presented in Table 5 (References 1-18).

TABLE 5 – Summary of Discharges for Detailed Riverine Studies

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second)			
		10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
BAILEY DITCH					
State Route 2	2.83	400	510	570	680
At mouth	8.25	390	500	560	670
BRUCE DITCH					
Parrish Avenue	1.91	340	440	490	590
181st Avenue	4.38	490	630	700	840
At mouth	9.89	460	590	650	780
BRYANT DITCH					
173rd Avenue	3.23	430	550	610	730
At mouth	5.2	270	350	390	460
BULL RUN					
Corporate limits (White Oak Avenue)	3.76	620	790	880	1,060
At confluence with St. John Ditch	5.5	530	680	770	920
BULL RUN TRIBUTARY					
At mouth	1.5	310	400	440	530
BURNS DITCH					
At Gary	160	2,645	4,040	4,640	6,170
At Interstate Highways 80 and 90	166	2,740	4,180	4,800	6,380
CADY MARSH DITCH					
At Cline Avenue	6.65	310	355	375	555
At Colfax Street	4.12	195	240	285	
At mouth	15.8	875	860	940	1,170
CEDAR CREEK					
At mouth of Cedar Lake (USGS gage No. 05-5187)	8.14	225	290	320	320
At the inlet to Lake Dalecarlia near Reeder Road	10.0	265	335	375	375
161st Avenue	20.1	790	1,010	1,120	1,340
176th Avenue	26.2	1,030	1,320	1,470	1,760
At State Route 2	26.9	1,040	1,340	1,490	1,790
Louisville and Nashville Railroad	28.2	1,060	1,370	1,520	1,820
At mouth	31.3	1,160	1,490	1,650	1,980

TABLE 4 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second)			
		10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
CHAPEL MANOR LATERAL					
At upstream limit of study	1.4	130	190	220	290
Upstream of Highland Road	2.7	180	270	310	410
At mouth	4.8	240	360	420	550
DEEP RIVER					
U.S. Route 30	17.9	1,653	2,523	2,900	3,857
DEEP RIVER					
Above confluence of Deer Creek	44.5	1,140	1,740	2,010	2,670
Downstream of Deer Creek confluence	50.5	1,310	2,000	2,300	3,060
At the U. S. Route 30 bridge	65.8	1,610	2,460	2,830	3,760
Grand Trunk Western Railroad	67.5	1,710	2,610	3,000	3,900
City of Hobart corporate limits	72.2	1846	2,818	3,240	4,309
At Hobart Darn	124	2,680	4,090	4,700	6,250
Upstream New Chicago Corporate Limits	147.3	3,100	4,630	5,440	7,240
Downstream New Chicago Corporate Limits	148.9	3,140	4,790	5,500	7,320
Above Little Calumet River	151	3,140	4,790	5,500	7,315
DEER CREEK					
109th Avenue	1.47	130	200	230	310
At mouth	6.08	270	400	470	630
DINWIDDIE DITCH					
State Route 2	2.17	360	470	520	620
At mouth	3	410	520	580	700
DUCK CREEK					
At upstream corporate limits	13.9	410	615	710	940
At mouth	15.8	470	655	760	1,000
DYER DITCH					
Just upstream of 77th Avenue	1.65	180	250	280	350
Upstream of Seaboard Stm. Railroad	1.8	230	310	350	430
Downstream of Schilling Ditch	5.94	530	730	820	1,050
Just downstream of Elgin Joliet and Eastern Railway	8.17	--	--	785	940
Just upstream of 213th Street	7.5	--	--	570	700
At mouth	9.54	--	--	785	940

TABLE 5 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
FOSS DITCH					
Clark Street	4.95	520	670	740	890
At mouth	7.59	620	790	880	1,060
GRAND CALUMET RIVER					
Downstream of Rhode lsland Street	1.38	155	185	200	230
Sohl Avenue	3.4	415	460	470	500
GRAND CALUMET RIVER					
Illinois State Boundary	3.6	415	460	470	500
Rhode Island Street	4.55	1,085	1,140	1,165	1,220
Below Indiana Harbor Canal	4.6*				
Polk Street	6.09	1,560	1,750	1,825	2,005
Norfolk and Western Railway	10.46	2,315	2,570	2,660	2,875
Colfax Street	16.14	2,825	3,230	3,380	3,740
Cline Avenue	18.13	2,940	3,430	3,585	4,020
Above Indiana Harbor Canal	22.26	3,090	3,590	3,765	4,195
Kennedy Avenue	22.26	3,090	3,590	3,765	4,195
GRIESEL DITCH					
173rd Avenue	2.08	360	460	510	610
State Route 2	3.46	440	570	630	760
HART DITCH					
At Elgin Joliet and Eastern Railway	37.5	1,240	1,700	1,910	2,372
At Dyer Ditch	38.7	1,275	1,790	2,000	2,511
At Schoon Ditch (Munster)	52.8	1,700	2,350	2,650	3,305
At mouth	70.8	2,200	3,100	3,450	4,340
INDIANA HARBOR CANAL					
Grand Calumet confluence	27*	3,295	3,825	4,025	4,390
Above Lake George Canal	28.47*	3,295	3,825	4,025	4,390
Below Lake George Canal	33.10*	4,020	4,605	4,815	5,225
KAISER DITCH					
At upstream limit of study	2.2	170	240	275	365
At mouth	37	208	315	365	480
KANKAKEE RIVER					
State Route 55	1,778	5,550	6,700	7,150	8,350
Above Beaver Lake Ditch (two miles downstream of Schneider)	1,846	5,700	6,900	7,380	8,400
State boundary	1,920	5,850	7,100	7,580	8,850

TABLE 5 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
LAKE GEORGE CANAL					
Above Indiana Harbor Canal	1.35	145	200	220	250
LITTLE CALUMET RIVER					
Confluence with Plum Creek	71*	970	1,150	1,210	1,380
Kennedy Avenue	72*	1,230	1,950	2,165	2,875
Cline Avenue	75.8*	1,195	1,335	1,390	1,520
LITTLE CALUMET RIVER					
Illinois State Boundary	76*	1,015	1,330	1,450	1,635
Chase Street	84.1*	320	585	640	735
Conrail	882*	300	370	435	555
MAIN BEAVER DAM DITCH					
Blame Street	2.58	180	260	310	420
Confluence of Main Beaver Dam Ditch Tributary BL	9.39	330	490	580	780
Conrail	13.12	400	600	700	940
At S. R. 55	17.7	520	800	920	1,220
Upstream of Madison Road	21	630	960	1,100	1,450
Downstream at Crown Point FIS study limit	25	730	1,100	1,280	1,690
101st Avenue	40.5	1,140	1,745	2,005	2,665
MAIN BEAVER DAM DITCH TRIBUTARY SOUTH					
At upstream end of Crown Point FIS study limit	1.7	140	210	240	320
At mouth	3.1	190	290	330	440
MAIN BEAVER DAM DITCH TRIBUTARY BE					
U.S Route 231	2.34	190	280	330	440
At mouth	3.76	210	320	370	500
MAIN BEAVER DAM DITCH TRIBUTARY BL					
At mouth	5.13	330	490	580	780
MAIN BEAVER DAM DITCH TRIBUTARY BN					
At mouth	2.82	310	470	550	740

TABLE 5 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
MAIN BEAVER DAM DITCH TRIBUTARY BV					
At mouth	2.5	380	560	660	880
MAIN BEAVER DAM DITCH TRIBUTARY LP					
At mouth	2.83	170	250	290	390
MCCONNELL DITCH					
171st Avenue	3.44	440	570	630	760
At mouth	3.98	470	600	670	800
MEADOWDALE LATERAL					
At mouth	7.42	300	450	520	690
NEW ELLIOTT TRIBUTARY					
At mouth	2.02	150	230	270	360
NILES DITCH					
129th Avenue	1.63	140	200	240	320
121st Avenue	6.5	280	410	490	650
Conrail	9	320	480	570	760
At mouth	11.2	370	550	650	860
NILES DITCH TRIBUTARY NT					
At mouth	1.63	130	200	230	310
NILES DITCH TRIBUTARY NS					
At mouth	2.36	170	250	290	390
REDWING TRIBUTARY					
Beishaw Road	2	350	450	500	500
At mouth	2.8	400	510	570	680
SCHERERVILLE DITCH					
Confluence with Dyer Ditch	1.85	180	240	260	320
SCHILLING DITCH					
Corporate limits (77th Avenue)	1.41	150	190	220	260
Confluence with Dyer Ditch	3.1	280	360	400	480
SCHOON DITCH					
At mouth	1.8	195	270	300	385

TABLE 5 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
SEBERGER DITCH					
At Redar Drive	--	138	176	196	235
At Mary Street	--	143	184	204	245
590’ downstream of Central Avenue	--	268	216	240	288
1,975’ downstream of Central Avenue	--	196	252	280	336
900’ upstream of Division Street	--	210	270	300	360
820’ downstream of Division Street	--	238	306	340	348
375’ downstream of Gatlin Road	--	258	331	368	442
SEBERGER DITCH					
Downstream of Conrail	--	280	360	400	480
Downstream of Unnamed Court	--	308	396	440	528
At 53rd Avenue	--	320	410	456	547
SINGLETON DITCH					
State Route 2	342	1,360	1,920	2,260	2,940
SPRING RUN					
153rd Avenue	2.31	370	480	530	640
169th Avenue	6.72	570	730	810	970
Belshaw Road	9.13	660	850	940	1,130
At mouth	12.7	560	720	800	950
SPRING STREET DITCH					
At mouth	6.27	225	400	475	650
SPROUT DITCH					
Colorado Street	1.9	150	220	260	350
Grand Trunk Western Railroad	3.64	220	320	380	510
City of Hobart corporate limits	593	260	390	460	620
SPROUT DITCH TRIBUTARY SV					
At mouth	1.43	200	300	350	470
SPROUT DITCH TRIBUTARY SU					
At mouth	1.36	130	190	220	290
ST. JOHN DITCH					
At outlet	1.2	280	360	400	480
STONY RUN					
Iowa Street	4.34	480	620	60	830
145th Avenue	7.9	620	800	890	1,070

TABLE 5 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
STONY RUN					
Upstream of confluence of Middle Branch Stony Run	11.7	740	950	1.05	1,260
At mouth	34.2	1,050	1,350	1,500	1,800
STONY RUN - EAST BRANCH					
123rd Avenue	3.76	460	590	650	780
129th Avenue	4.83	500	650	720	860
137th Avenue	7.5	610	780	870	1,040
At mouth	13.7	780	1,010	1,120	1,340
STONY RUN - MIDDLE BRANCH					
145th Avenue	1.05	270	340	380	460
Hancock Street	1.84	340	430	480	580
At mouth	15.9	360	470	520	620
STONY RUN TRIBUTARY ES					
At mouth	3	410	530	590	710
STONY RUN TRIBUTARY ET					
At mouth	2.2	360	470	520	620
TURKEY CREEK					
At Seberger Road	4.74	218	326	374	515
At US 30	4.89	231	347	398	547
Cline Avenue	4.92	282	423	486	668
At State Route 73	6.04	306	459	527	725
Above New Elliot Tributary	8.28	660	1,000	1,200	1,550
Above Kaiser Ditch	17.50	680	1,050	1,220	1,590
At State Route 55	21.2	790	1,200	1,400	1,820
Downstream of Meadowdale Lateral	28.55	1,000	1,550	1,800	2,350
Above confluence of Chapel Manor Lateral	29.58	1,040	1,600	1,850	2,410
Downstream of confluence of Chapel Manor Lateral	33.94	1,225	1,870	2,150	2,860
At inlet to Lake George	37.88	1,270	1,940	2,230	2,965
WEST CREEK					
125th Avenue	17	700	900	1,000	1,200
135th. Avenue	21.6	840	1,080	1,200	1,440
151st Avenue	28.3	1,060	1,360	1,510	1,810

TABLE 5 – Summary of Discharges for Detailed Riverine Stuides (*continued)*

FLOODING SOURCE AND LOCATION	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
WEST CREEK					
169th Avenue	39	1,400	1,800	2,000	2,400
197th Avenue	50.4	1,680	2,160	2,400	2,880
At mouth	55.1	1,860	2,390	2,650	3,180
Upstream side of St. John southern corporate boundary	67	620	790	880	1,060
117th Avenue	150	640	830	920	1,100
185th Avenue	440	1,540	1,980	2,200	2,640
WEST CREEK TRIBUTARY WJ					
U.S. Route 231	4.6	500	640	710	850
At mouth	5.02	510	660	730	880
WEST CREEK TRIBUTARY WS					
White Oak Avenue	1.5	310	400	440	530
At mouth	3.37	430	560	620	740
WEST CREEK TRIBUTARY WT					
185th Avenue	2.75	400	510	570	680
At mouth	4.25	480	610	680	820
WEST CREEK TRIBUTARY WX					
At mouth	2.96	410	530	590	710
WEST CREEK TRIBUTARY WY					
At mouth	2.4	380	490	540	650
WEST CREEK TRIBUTARY WZ					
At mouth	3.36	430	560	620	740

*Drainage area may vary to shifts in flow of the Grand Calumet River

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Pre-Countywide Analyses

Detail-studied streams that were not re-studied as part of this map update may include a “profile base line” on the maps. This “profile base line” provides a link to the flood profiles included in the Flood Insurance Study report. The detail-studied stream centerline may have been digitized or redelineated as part of this revision. The “profile base lines” for these streams were based on the best available data at the time of their study and are depicted as they were on the previous FIRMs. In some cases where improved topographic data was used to redelineate floodplain boundaries, the “profile base line” may deviate significantly from the channel centerline or may be outside the Special Flood Hazard Area (SFHA).

Stream cross-sections were obtained by field surveys, topography, or photogrammetric methods. The extents of cross-sections were determined with field inspection. Additionally, bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Water surface elevations for the selected return-intervals were computed for each of the detailed streams within Lake County. Two methods were used to produce the associated flood profiles. The SCS’s WSP2 software program (Reference 36) was used to determine the desired water surface elevations for the following stream reaches within the unincorporated areas of Lake County and the incorporated areas of St. John, Cedar Lake, Lowell, and Schererville:

> Bailey Ditch, Bruce Ditch, Brown Ditch, Bull Run, Cedar Creek, Dinwiddie Ditch, Foss Ditch, Griesel Ditch, McConnel Ditch, New Elliot Tributary, Niles Ditch, Redwing Ditch, Schererville Ditch, Schilling Ditch, Singleton Ditch, Spring Run, Sprout Ditch, Stony Run, West Creek, and St. John Creek.

The COE’s HEC-2 hydraulic modeling software was used to calculate the desired water surface elevations for the following stream reaches within the unincorporated areas of Lake County and the incorporated areas of Griffith, Highland, Merrillville, Gary, Hobart, Lake Station, Schererville, Dyer, East Chicago, Crown Point, and Munster:

> Cady Marsh, Chapel Manor Lateral, Deep River, Duck Creek, Indiana Harbor Canal, Kaiser, Ditch, Lake George Canal, Main Beaver Dam Ditch, Meadowdale Lateral, Schoon Ditch, Spring Street Ditch, and West Creek.

The starting water surface elevations for the detailed studies within Lake County were determined using several methods. Starting water surface elevations for Cedar Creek were taken from downstream data for the upper end of Lake

Dalecarlia. The starting water surface elevations for McConnel Ditch were calculated using WSP2. COE Floodplain Info Reports provided the starting water surface elevations for Seberger Ditch and Turkey Creek (Reference 37). The depth at normal flow was used for the starting water surface elevations for Schererville Ditch, Schilling Ditch, Spring Street Ditch, Cady Marsh, and Dyer Ditch. The slope/area method for the HEC-2 program was employed to calculate the starting water surface elevations for Chapel Manor Lateral, Meadowdale Lateral, Turkey Creek, Kaiser Ditch, Duck Creek, Schoon Ditch, and Plum Creek. The gage station rating curves at Lake Station for Burns Ditch provided the starting water surface elevations for the selected return intervals. Finally, all additional starting water surface elevations for streams studied in detail were determined from the flood profile of their parent stream.

Channel roughness factors (Manning's "n") used in hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas.

Table 6 displays the Manning's "n" values used in the hydraulic analyses from previous Flood Insurance Studies (References 1-18).

TABLE 6 – Previous FIS Manning's "n" Values

Flooding Source	Main Channel	Overbank
Bailey Ditch	0.040 - 0.060	0.06
Bruce Ditch	0.050 - 0.080	0.07
Bryant Ditch	0.050 - 0.100	0.060 - 0.070
Bull Run and Bull Run Tributary	0.040 - 0.080	0.050 - 0.090
Burns Ditch	0.035 - 0.040	0.040 - 0.110
Cady Marsh	0.030 - 0.080	0.030 - 0.090
Cedar Creek	0.038 - 0.080	0.030 - 0.100
Chapel Manor Lateral	0.020 - 0.050	0.020 - 0.100
Deep River	0.035 - 0.050	0.050 - 0.110
Deer Creek	0.050 - 0.070	0.060 - 0.090
Dinwiddie Ditch	0.045 - 0.100	0.060 - 0.070
Duck Creek	0.035 - 0.055	0.060 - 0.090
Foss Ditch	0.040 - 0.080	0.040 - 0.100
Griesel Ditch	0.055 - 0.090	0.070
Indiana Harbor Canal	0.030 - 0.035	0.045 - 0.050
Kaiser Ditch	0.015 - 0.060	0.050 - 0.060
Kankakee River	0.025 - 0.033	0.070 - 0.140
Lake George Canal	0.030 - 0.035	0.045 - 0.050
Little Calumet River	0.025 - 0.045	0.070 - 0.090
Main Beaver Dam Ditch and Tributaries	0.024 - 0.090	0.020 - 0.120
McConnel Ditch	0.045 - 0.080	0.050 - 0.090
Meadowdale Lateral	0.020 - 0.050	0.020 - 0.080
New Elliott Tributary	0.030 - 0.100	0.035 - 0.120

TABLE 6 – Previous FIS Manning's "n" Values *(continued)*

Flooding Source	Main Channel	Overbank
Niles Ditch and Tributaries	0.050 - 0.070	0.070 - 0.090
Redwing Tributary	0.070 - 0.100	0.050 - 0.070
Schererville Ditch	0.040 - 0.070	0.035 - 0.120
Schilling Ditch	0.040 - 0.070	0.035 - 0.120
Schoon Ditch	0.030	0.080
Singleton Ditch	0.050 - 0.080	0.060 - 0.120
Spring Run	0.050 - 0.100	0.050 - 0.080
Spring Street Ditch	0.030 - 0.055	0.055 - 0.060
Sprout Ditch and Tributaries	0.050 - 0.080	0.060 - 0.120
St John Ditch	0.040 - 0.080	0.050 - 0.090
Stony Run and Tributaries	0.050 - 0.080	0.070 - 0.100
West Creek and Tributaries	0.020 - 0.100	0.020 - 0.120

Countywide Analyses

Conversions of seven hydraulic models for detailed study of five (5) streams were completed and are listed below:

- Dyer Ditch
- Grand Calumet River – Central
- Grand Calumet River – East
- Grand Calumet River – West
- Seberger Ditch
- Hart Ditch
- Turkey Ditch

The hydraulic models have been converted into the HEC-RAS format and the cross sections have been digitized and spatially referenced. The dated cross section topographic elevation data was replaced with 2001 data pulled from topographic data with 1-foot contour interval provided by Lake County Surveyors Office.

The Grand Calumet River modeling was performed on three reaches: Grand Calumet River – Central, Grand Calumet River – East and Grand Calumet River – West. The East and West reaches were modeled flowing west towards the Indiana – Illinois state boundary. Due to backwater from the Indiana Harbor Canal, the Grand Calumet River – Central reach was modeled flowing east towards the Indiana Harbor Canal; hydraulic modeling of this reach did not take into consideration backwater from the Indiana Harbor Canal.

Channel roughness factors (Manning's "n") used in hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas.

Table 7 displays the Manning's "n" values used in the hydraulic analyses.

TABLE 7 – New Detailed Studies Manning's "n" Values

Flooding Source	Main Channel	Overbank
Dyer Ditch	0.015 - 0.065	0.090 - 0.120
Grand Calumet – Central	0.035 - 0.05	0.035 - 0.050
Grand Calumet – East	.035	.05
Grand Calumet – West	.035	.05
Hart Ditch	0.040 - 0.150	0.040 - 0.150
Seberger Ditch	0.035 - 0.050	0.050 - 0.120
Turkey Creek	0.030 - 0.050	0.035 - 0.090

After completion of the topographic replacement and review of input parameters against the new cross section data, the floodway was developed with a 0.1' surcharge after the 10-, 2-, 1-, and 0.2-percent annual chance events had been calculated. Check-RAS was utilized to identify potential errors within the models.

Additionally, new approximate studies were performed for the following streams:

- Brown Ditch
- Cedar Creek
- Deep River
- Unnamed Streams 1 - 8

The hydraulic modeling for the approximate study reaches included the 1-percent annual chance event based on peak discharges. Flood depth data for approximate stream reaches was developed using a simplified HEC-RAS hydraulic model

Hydrodynamic parameters for the model were estimated from data collected during the site visit and published sources. Manning's "n" values ranging from .035 to .05 were estimated at each cross section to be used for calculation water depth. Cross section data was extracted from the County digital topographic data and inserted into the HEC-RAS model. Cross-section locations were located at intervals sufficient to create a stable hydraulic model. Structures were not modeled.

Table 5 contains flood level information of Lake Michigan (Reference 35) as well as flood level information for Golf Lake and the Town of Highland's levee along the Little Calumet River obtained from Letters of Map Revision.

TABLE 8. Summary of Stillwater Elevations

	Elevations Feet (NAVD88)			
Flooding Source and Location	10-Percent Annual Chance Event	2-Percent Annual Chance Event	1-Percent Annual Chance Event	0.2-Percent Annual Chance Event
Lake Michigan	583.2	584.3	584.7	585.6
Little Calumet River	*	*	591.2	*
Golf Lake	*	*	665.3	*
Unnamed Ponding Area in Town of St. John	*	*	668.1	*

* Data not available

Flood profiles were drawn showing the computed water surface elevations for floods of the selected recurrence intervals. In cases where the 2- and 1-percent annual chance flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been drawn.

The hydraulic analyses for this study are based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail, and if the channel and overbank conditions remain essentially the same as ascertained during the study.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Effective information for this FIS report was converted from NGVD29 to NAVD88 using a countywide average conversion of -0.5 feet (NGVD29 – 0.5 ft = NAVD88). Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent counties may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages the State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent annual chance flood elevations and delineations of the 1- and 0.2-percent annual chance floodplain boundaries and 1-percent annual chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Tables, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Information on the methods used to delineate the flooding for each of the previously printed FIS reports and FIRMs for communities within Lake County was compiled and is shown below. Between cross sections, the boundaries were interpolated using digital basemap information.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the DFIRM (Exhibit 2). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE); and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of the areas of moderate flood hazards (Zone X). In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent annual chance floodplain boundary is shown on the DFIRM (Exhibit 2). Approximate 1-percent annual chance floodplain boundaries were delineated using the digital basemap information described above. Approximate flood boundaries in some portions of the study area were digitized from the previous Flood Insurance Rate Maps or Flood Hazard Boundary Maps.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The State of Indiana standards limit such increases to 0.1 foot. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report and on the DFIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 9). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The floodways in Indiana are drawn to include the entire structural portion of dikes, levees, flood walls and any man-made structures which occupy area that would otherwise have been covered by moving floodwaters of the 1-percent annual chance flood. In some locations, the floodway width has been modified to meet IDNR standards and may not match values from previous hydraulic modeling; these locations are noted in Table 9.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 0.1-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation of the 1-percent annual chance flood more than 0.1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are presented in Figure 1.

As part of the redelineation efforts, floodway widths for previously effective detailed studies were digitized from the previously effective FIRM and transferred onto the updated base mapping. As a result of differences between the original and updated base mapping, floodway widths in some areas may have changed in association with the redelineated floodplain boundary. In those instances, revised floodway widths have been included in Table 9.

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or used as a basis for additional studies.

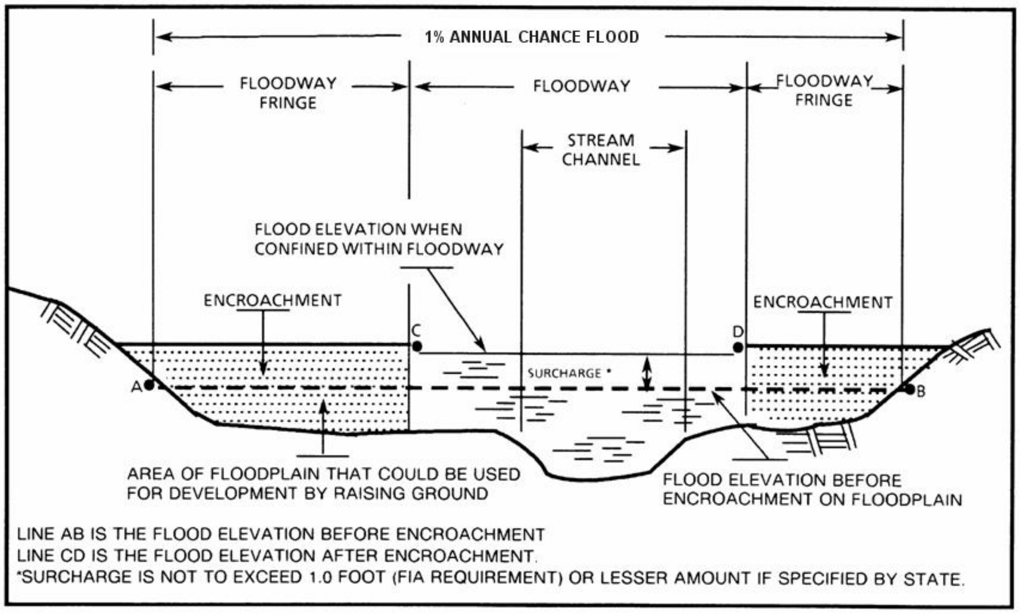


Figure 1 - Floodway Schematic

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bailey Ditch									
A	7,500	2,229	1,100	0.4		633.2	633.2	633.3	0.1
B	10,300	3,177	1,339	0.6		634.2	634.2	634.3	0.1
C	12,750	3,516	884	0.8		639.0	639.0	639.1	0.1
D	16,400	154	226	2.7		651.9	651.9	652.0	0.1
E	17,800	148	258	2.3		656.3	656.3	656.4	0.1
F	19,480	165	513	1.0		661.0	661.0	661.1	0.1
G	21,790	201	275	1.5		665.7	665.7	665.8	0.1
Bruce Ditch									
A	4,690	194	333	2.0		636.4	636.4	636.5	0.1
B	8,090	444	565	1.1		639.2	639.2	639.3	0.1
C	9,970	58	300	2.1		641.6	641.6	641.7	0.1
D	12,070	68	220	2.8		645.7	645.7	645.8	0.1
E	14,840	577	645	1.5		651.2	651.2	651.3	0.1
F	17,340	273	610	1.5		654.7	654.7	654.8	0.1
G	20,100	475	861	1.0		658.4	658.4	658.5	0.1
H	21,850	562	770	1.0		660.5	660.5	660.6	0.1
I	24,850	409	577	1.4		664.3	664.3	664.4	0.1
J	26,830	270	476	1.6		668.8	668.8	668.9	0.1
K	28,550	376	668	1.1		670.9	670.9	671.0	0.1
L	30,790	600	702	1.0		673.9	673.9	674.0	0.1
M	32,740	417	398	1.4		677.7	677.7	677.8	0.1
N	36,240	349	410	1.2		689.5	689.5	689.6	0.1
O	37,730	88	182	2.6		694.9	694.9	695.0	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

**LAKE COUNTY, INDIANA
AND INCORPORATED AREAS**

FLOODWAY DATA

Bailey Ditch, Bruce Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bryant Ditch									
A	5,280	980	961	0.8		648.7	648.7	648.8	0.1
B	8,400	477	549	1.3		656.4	656.4	656.5	0.1
C	10,790	211	249	2.7		662.2	662.2	662.3	0.1
D	12,740	255	463	1.4		664.5	664.5	664.6	0.1
E	15,140	220	355	1.8		676.4	676.4	676.5	0.1
F	17,520	242	449	1.4		680.9	680.9	681.0	0.1
G	19,230	150	250	2.4		682.7	682.7	682.8	0.1
H	21,890	845	367	1.3		685.9	685.9	686.0	0.1
I	23,410	35	139	3.1		690.3	690.3	690.4	0.1
J	24,960	250	352	1.2		692.5	692.5	692.6	0.1
Bull Run									
A	510	258	813	1.1		674.6	674.6	674.7	0.1
B	1,220	203	760	1.2		675.1	675.1	675.2	0.1
C	2,200	374	953	0.9		675.7	675.7	675.8	0.1
D	2,500	239	552	1.6		676.1	676.1	676.2	0.1
E	3,450	237	723	1.2		677.0	677.0	677.1	0.1
F	4,740	274	867	1.0		677.6	677.6	677.7	0.1
G	5,980	411	1,108	0.8		678.2	678.2	678.3	0.1
H	7,540	306	1,141	0.8		678.6	678.6	678.7	0.1
I	9,730	491	1,561	0.6		679.3	679.3	679.4	0.1
J	11,050	396	807	1.1		680.0	680.0	680.1	0.1
K	12,500	136	464	1.0		680.6	680.6	680.7	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Bryant Ditch, Bull Run

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bull Run									
L	14,550	800	3,074	0.1		681.0	681.0	681.1	0.1
M	16,595	845	3,946	0.1		681.0	681.0	681.1	0.1
N	17,295	405	1,281	0.3		681.0	681.0	681.1	0.1
Bull Run Tributary									
A	610	187	649	0.7		680.5	680.5	680.6	0.1
B	2,810	334	613	0.6		682.2	682.2	682.3	0.1
Burns Ditch									
A	0 [3]	316 / 230 [4]	1,805	2.7		594.5	594.5	594.6	0.1
B	1,030 [3]	470	2,509	1.9		594.7	594.7	594.8	0.1
C	1,330 [3]	660(177) [5]	2,241	2.1		594.8	594.8	594.9	0.1
D	1,802 [3]	740(116) [5]	1,584	3.0		594.9	594.9	595.0	0.1
E	2,342 [3]	1,160(1,106) [5]	3,959	1.2		595.1	595.1	595.2	0.1
F	2,982 [3]	1,150(133) [5]	1,781	2.7		595.2	595.2	595.3	0.1
G	3,274 [3]	1,020(620) [5]	3,372	1.4		595.3	595.3	595.4	0.1
H	4,474 [3]	1,394	6,013	0.8		595.5	595.5	595.6	0.1
I	5,154 [3]	1,195(120) [5]	1,751	2.7		595.5	595.5	595.6	0.1
J	5,488 [3]	1,100(1,366) [5]	4,258	1.1		595.6	595.6	595.7	0.1
K	6,908 [3]	1,070	5,781	0.8		595.7	595.7	595.8	0.1
L	9,558 [3]	2,664	13,356	0.3		595.8	595.8	595.9	0.1
M	11,908 [3]	2,504	11,821	0.4		595.8	595.8	595.9	0.1
N	14,858 [3]	2,673	13,804	0.3		595.8	595.8	595.9	0.1
O	16,058 [3]	2,689	13,902	0.3		595.8	595.8	595.9	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]Feet above county limits [4]Total Width / Width Within County Limits
[5]Floodway modified to meet IDNR standards; value in ( ) is HEC-2 program value

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Bull Run, Bull Run Tributary, Burns Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Burns Ditch									
P	16,258 [1]	2,575	5,195	0.9		595.8	595.8	595.9	0.1
Q	21,948 [1]	1,180	4,895	1.1		596.6	596.6	596.7	0.1
Cady Marsh Ditch									
A	3586 [3]	39	304	1.9		607.7	607.7	607.8	0.1
B	4980 [3]	20	160	3.6		608.2	608.2	608.3	0.1
C	6311 [3]	26	152	3.8		608.8	608.8	608.9	0.1
D	8600 [3]	35	176	2.9		610.2	610.2	610.3	0.1
E	10,310 [3]	117	296	1.4		610.8	610.8	610.9	0.1
F	11,594 [3]	1,020	927	0.4		611.0	611.0	611.1	0.1
G	12,138 [3]	660	223	1.8		611.0	611.0	611.1	0.1
H	12,750 [3]	1,440	2,267	0.2		611.1	611.1	611.2	0.1
I	14,189 [3]	320	171	2.1		611.4	611.4	611.5	0.1
J	14,891 [3]	58	188	1.7		611.5	611.5	611.6	0.1
K	15,654 [3]	42	184	1.6		611.7	611.7	611.8	0.1
L	17,174 [3]	44	144	1.8		611.9	611.9	612.0	0.1
M	17,842 [3]	42	201	1.2		612.1	612.1	612.2	0.1
N	19,002 [3]	58	162	1.7		612.2	612.2	612.3	0.1
O	19,545 [3]	830	1,984	0.1		612.3	612.3	612.4	0.1

[1]Feet above county limits [2]See Explanation in Section 4.2 Floodways [3] Feet above mouth

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Burns Ditch, Cady Marsh Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cady Marsh Ditch									
P	20,340	830	828	0.3		612.5	612.5	612.6	0.1
Q	21,650	1,169	2,763	0.1		612.9	612.9	613.0	0.1
R	23,040	1,371	125	1.4		613.1	613.1	613.2	0.1
S	24,300	1,261	3,136	0.1		613.7	613.7	613.7	0.0
T	25,595	1,168	1,453	0.1		613.8	613.8	613.9	0.1
U	26,825	968	104	1.3		614.0	614.0	614.1	0.1
V	27,900	780	872	0.1		614.3	614.3	614.3	0.0
W	29,460	990	1,740	0.1		614.4	614.4	614.4	0.0
X	31,110	765	1,370	0.1		614.5	614.5	614.5	0.0
Y	32,975	700	1,191	0.1		614.7	614.7	614.7	0.0
Cedar Creek									
A	5,610	933	1,433	1.1		640.1	640.1	640.2	0.1
B	8,130	636	1,122	1.4		643.8	643.8	643.9	0.1
C	10,650	1,655	5,000	0.3		647.0	647.0	647.1	0.1
D	13,580	810	1,222	1.3		650.7	650.7	650.8	0.1
E	16,030	557	1,525	1.0		651.9	651.9	652.0	0.1
F	18,470	247	790	2.0		654.3	654.3	654.4	0.1
G	20,070	211	1,015	1.5		656.4	656.4	656.5	0.1
H	21,510	950	3,712	0.4		656.6	656.6	656.7	0.1
I	23,680	644	1,734	0.9		658.1	658.1	658.2	0.1
J	24,980	800	2,000	0.8		658.2	658.2	658.3	0.1
K	26,060	540	1,734	1.3		659.1	659.1	659.2	0.1
L	26,580	88	1,186	4.9		661.0	661.0	661.1	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Cady Marsh Ditch, Cedar Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cedar Creek									
M	26,720	70	306	6.3		662.1	662.1	662.2	0.1
N	27,060	347	240	1.8		663.1	663.1	663.2	0.1
O	27,460	124	813	3.9		663.9	663.9	664.0	0.1
P	28,030	157	384	2.8		665.5	665.5	665.6	0.1
Q	28,550	54	533	5.0		667.5	667.5	667.6	0.1
R	28,790	117	301	2.3		669.4	669.4	669.5	0.1
S	29,590	364	648	0.8		669.7	669.7	669.8	0.1
T	29,970	108	1,973	2.3		670.0	670.0	670.1	0.1
U	30,310	236	655	1.1		670.8	670.8	670.9	0.1
V	31,150	365	1,861	0.8		671.0	671.0	671.1	0.1
W	31,740	195	986	1.4		671.5	671.5	671.6	0.1
X	33,260	458	1,353	0.6		671.7	671.7	671.8	0.1
Y	35,100	367	2,320	1.0		672.3	672.3	672.4	0.1
Z	36,110	307	1,416	0.9		672.6	672.6	672.7	0.1
AA	37,260	356	1,111	1.2		673.5	673.5	673.6	0.1
AB	39,210	489	1,072	1.3		675.9	675.9	676.0	0.1
AC	40,360	337	1,627	0.8		676.3	676.3	676.4	0.1
AD	42,210	369	1,294	1.0		677.5	677.5	677.6	0.1
AE	43,960	247	887	1.5		680.0	680.0	680.1	0.1
AF	53,720	66	246	1.5		687.6	687.6	687.7	0.1
AG	54,630	713	1,782	0.2		687.6	687.6	687.7	0.1
AH	56,130	134	334	1.1		688.3	688.3	688.4	0.1
AI	56,840	134	1,384	0.3		689.4	689.4	689.5	0.1
AJ	57,620	286	467	0.7		689.6	689.6	689.7	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Cedar Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[6] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cedar Creek									
AK	58,930 [1]	71	178	1.9		691.9	691.9	692.0	0.1
AL	59,180 [1]	157	450	0.7		693.0	693.0	693.1	0.1
AM	59,440 [1]	185	576	0.6		693.3	693.3	693.4	0.1
AN	60,130 [1]	211	243	1.3		693.7	693.7	693.8	0.1
AO	61,010 [1]	329	348	0.9		694.4	694.4	694.5	0.1
Chapel Manor Lateral									
A	370 [2]	69	106 [3]	3.9 [3]		617.9	614.8 [5]	614.9	0.1
B	560 [2]	26	64 [3]	6.5 [3]		617.9	615.6 [5]	615.6	0.0
C	1902 [2]	224	721 [3]	0.6 [3]		621.8	621.8	621.8	0.0
D	2642 [2]	104	235 [3]	1.8 [3]		622.0	622.0	622.0	0.0
E	2772 [2]	30	69 [3]	6.0 [3]		622.1	622.1	622.1	0.0
F	3802 [2]	121	326 [3]	1.3 [3]		623.9	623.9	624.0	0.1
G	4030 [2]	50 [4]	138 [3]	3.0 [3]		624.4	624.4	624.4	0.0
H	5470 [2]	68	203 [3]	2.0 [3]		627.4	627.4	627.5	0.1
I	6630 [2]	62	195 [3]	2.1 [3]		629.4	629.4	629.5	0.1
J	6842 [2]	46	97 [3]	4.3 [3]		632.7	632.7	632.7	0.0
K	7142 [2]	107	198 [3]	2.1 [3]		633.8	633.8	633.9	0.1
L	7292 [2]	59	132 [3]	3.1 [3]		634.1	634.1	634.2	0.1
M	7446 [2]	27	98 [3]	4.3 [3]		635.0	635.0	635.1	0.1

[1]Feet Above Mouth [2]Feet above confluence with Turkey Creek [3]Computed without floodway modification [4]Floodway width modified to satisfy IDNR requirements; See explanation in Section 4.2
[5]Elevation computed without consideration of backwater effects from Turkey Creek [6]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Cedar Creek, Chapel Manor Lateral

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)[3]	MEAN VELOCITY (FEET PER SECOND)[3]	WIDTH REDUCED FROM PRIOR STUDY[4] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Chapel Manor Lateral									
N	7,544	60 [2]	139	3.0		635.8	635.8	635.9	0.1
O	7,792	22	117	3.3		636.4	636.4	636.5	0.1
P	8,081	125	492	0.8		636.8	636.8	636.9	0.1
Q	8,601	122	486	0.8		636.8	636.8	636.9	0.1
R	9,511	100 [2]	42	9.3		637.4	637.4	637.4	0.0
S	9,661	86	193	2.0		639.4	639.4	639.4	0.0
T	10,201	72	242	1.6		639.7	639.7	639.7	0.0
U	10,821	41	101	3.9		640.2	640.2	640.3	0.1
V	11,271	43	126	3.1		641.2	641.2	641.3	0.1
W	11,591	33	86	4.5		642.0	642.0	642.1	0.1
X	11,874	87	370	0.8		648.7	648.7	648.7	0.0
Y	12,104	64	253	1.2		648.8	648.8	648.8	0.0
Z	12,484	36	164	1.9		648.8	648.8	648.8	0.0
AA	13,244	25	81	3.8		649.3	649.3	649.3	0.0
AB	13,964	21	49	6.3		651.8	651.8	651.9	0.1
AC	14,836	48	255	1.2		658.5	658.5	658.5	0.0
AD	15,339	190	1,486	0.2		661.7	661.7	661.7	0.0
AE	15,714	71	336	0.9		661.7	661.7	661.7	0.0
AF	15,900	100	726	0.4		663.2	663.2	663.3	0.1
AG	16,595	25	44	7.0		665.4	665.4	665.5	0.1

[1]Feet above confluence with Turkey Creek [2]Floodway width modified to satisfy IDNR requirements [3]Computed without floodway modification
[4]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Chapel Manor Lateral

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deep River									
A	788	596	3,269	1.7		596.8	596.8	596.9	0.1
B	1,428	336	1,646	3.3		597.0	597.0	597.1	0.1
C	2,028	325	3,081	1.8		597.4	597.4	597.5	0.1
D	2,348	250(126) [3]	1,467	3.7		597.4	597.4	597.5	0.1
E	4,182	366	3,039	1.8		597.8	597.8	597.9	0.1
F	6,760	541	4,210	1.3		598.0	598.0	598.1	0.1
G	7,360	330(262) [3]	2,402	2.3		598.1	598.1	598.2	0.1
H	7,594	509	3,798	1.4		598.2	598.2	598.3	0.1
I	11,004	295	2,720	2.0		598.6	598.6	598.7	0.1
J	11,710	380(215) [3]	2,341	2.3		598.7	598.7	598.8	0.1
K	13,940	291	2,546	2.1		599.1	599.1	599.2	0.1
L	16,920	565	4,620	1.2		599.8	599.8	599.9	0.1
M	17,970	480(403) [3]	2,116	2.6		599.9	599.9	600.0	0.1
N	18,796	760(445) [3]	3,304	1.6		600.3	600.3	600.4	0.1
O	19,156	800(162) [3]	1,435	3.8		600.4	600.4	600.5	0.1
P	21,520	705	4,722	1.1		601.1	601.1	601.2	0.1
Q	23,390	849	6,694	0.8		601.4	601.4	601.5	0.1
R	25,710	680(335) [3]	3,284	1.6		601.8	601.8	601.9	0.1
S	26,122	720(1150) [3]	5,117	1.1		601.9	601.9	602.0	0.1
T	27,742	328	3,224	1.7		602.2	602.2	602.3	0.1
U	29,142	324	3,453	1.6		602.5	602.5	602.6	0.1
V	31,512	327	3,563	1.5		602.8	602.8	602.9	0.1
W	32,430	480	3,990	1.3		603.1	603.1	603.2	0.1
X	33,240	186	1,406	3.7		603.1	603.1	603.2	0.1

[1]Feet Above confluence with Burns Ditch [2]See Explanation in Section 4.2 Floodways

[3]Floodway modified to meet IDNR standards; Value in ( ) is HEC-2 program value; See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Deep River

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deep River									
Y	33,367	474	4,406	1.2		603.6	603.6	603.7	0.1
Z	35,467	355	3,614	1.4		603.9	603.9	604.0	0.1
AA	37,787	47	612	8.4		604.1	604.1	604.2	0.1
AB	38,449	368	2,143	2.2		609.6	609.6	609.7	0.1
AC	38,929	722	8,107	0.6		610.0	610.0	610.1	0.1
AD - AW *									
AX	58,985	610	2,730	1.2		613.0	613.0	613.1	0.1
AY	59,119	680	3,909	0.8		613.1	613.1	613.2	0.1
AZ	63,039	440	3,779	0.9		613.3	613.3	613.4	0.1
BA	63,659	500	802	4.0		613.3	613.3	613.4	0.1
BB	64,309	880	5,702	0.6		613.7	613.7	613.8	0.1
BC	64,409	722	5,515	0.6		613.7	613.7	613.8	0.1
BD	67,271	812	4,972	0.7		614.0	614.0	614.1	0.1
BE	72,182	653	2,881	1.1		615.5	615.5	615.6	0.1
BF	73,607	670	3,384	0.9		615.7	615.7	615.8	0.1
BG	80,049	966	2,798	1.1		619.9	619.9	620.0	0.1
BH	82,900	780	4,105	0.8		620.4	620.4	620.5	0.1
BI	83,534	795	4,547	0.7		621.3	621.3	621.4	0.1
BJ	85,540	598	1,444	2.1		623.6	623.6	623.7	0.1
BK	88,497	315	1,121	2.7		627.6	627.6	627.7	0.1
BL	88,919	479	2,378	1.3		630.0	630.0	630.1	0.1
BM	91,982	986	2,310	1.3		631.9	631.9	632.0	0.1
BN	94,094	205	913	3.3		635.2	635.2	635.3	0.1
BO	94,516	298 [3]	1,556	1.9		638.0	638.0	638.1	0.1

[1]Feet Above confluence with Burns Ditch [2]See Explanation in Section 4.2 Floodways
[3]This width extends beyond the county boundary *Floodway data not computed for cross-sections AD-AW

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Deep River

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deep River									
BP	94,938	492	1,789	1.7		638.4	638.4	638.5	0.1
BQ	96,734	241 [3]	950	3.1		640.4	640.4	640.5	0.1
BR	97,367	711	4,242	0.7		642.8	642.8	642.9	0.1
BS	107,716	421	1,877	1.5		650.1	650.1	650.2	0.1
BT	107,916	421	1,877 [5]	1.5 [5]		650.1	650.1	650.2	0.1
BU	108,820	589	2,056 [5]	1.4 [5]		651.8	651.8	651.9	0.1
BV	110,260	397	1,484 [5]	1.7 [5]		653.1	653.1	653.2	0.1
BW	110,850	683	2,810 [5]	0.9 [5]		654.4	654.4	654.4	0.0
BX	112,400	118	510 [5]	5.0 [5]		655.2	655.2	655.3	0.1
BY	116,400	643	2,274 [5]	1.0 [5]		659.6	659.6	659.7	0.1
BZ	117,670	301	1,078 [5]	2.1 [5]		660.2	660.2	660.3	0.1
CA	118,070	480 [4]	558 [5]	4.1 [5]		660.6	660.6	660.7	0.1
CB	119,750	468	1,678 [5]	1.4 [5]		662.7	662.7	662.8	0.1
CC	120,430	760	542 [5]	4.2 [5]		663.3	663.3	663.4	0.1
CD	120,599	910 [3]	10,270 [5]	0.2 [5]		664.0	664.0	664.1	0.1
CE	120,799	925	3,277 [5]	0.7 [5]		664.0	664.0	664.1	0.1
CF	122,419	64	522 [5]	4.4 [5]		664.4	664.4	664.5	0.1
CG	123,609	351	1,211 [5]	1.9 [5]		666.1	666.1	666.2	0.1
CH	124,789	316	1,195 [5]	1.7 [5]		666.8	666.8	666.9	0.1
CI	125,063	155	756 [5]	2.7 [5]		667.2	667.2	667.3	0.1
CJ	126,963	349	1,141 [5]	1.8 [5]		668.5	668.5	668.6	0.1
CK	128,833	328	998 [5]	2.0 [5]		669.7	669.7	669.8	0.1
CL	130,413	580 [3]	480 [5]	4.2 [5]		671.1	671.1	671.2	0.1
CM	130,627	614	1,721 [5]	1.2 [5]		671.7	671.7	671.8	0.1

[1]Feet Above confluence with Burns Ditch [2]See Explanation in Section 4.2 Floodways [3]This width extends beyond the county boundary
[4]Floodway width modified to satisfy IDNR requirements; See explanation in Section 4.2 [5]Section area and mean velocity computed without floodway modification; See explanation in Section 4.2

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Deep River

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deep River									
CN	132,547 [1]	357	1,159 [5]	1.7 [5]		672.3	672.3	672.4	0.1
CO	134,207 [1]	87	705 [5]	2.8 [5]		673.2	673.2	673.3	0.1
CP	136,317 [1]	511	1,971 [5]	1.0 [5]		674.2	674.2	674.3	0.1
CQ	137,899 [1]	289	580 [5]	3.5 [5]		675.0	675.0	675.1	0.1
Deer Creek									
A	6,470 [4]	509	474	0.7		674.4	674.4	674.5	0.1
B	8,270 [4]	838	964	0.3		674.8	674.8	674.9	0.1
C	10,670 [4]	564	284	1.1		681.3	681.3	681.4	0.1
D	13,470 [4]	131	145	1.6		686.8	686.8	686.9	0.1
E	16,270 [4]	123	132	1.5		696.7	696.7	696.8	0.1
Dinwiddie Ditch									
A	5,110 [4]	4,634	2,891	0.2		646.0	646.0	646.1	0.1
B	7,890 [4]	3,000	587	1.0		652.8	652.8	652.9	0.1
C	10,040 [4]	768	419	1.2		660.2	660.2	660.3	0.1
D	11,500 [4]	73	132	3.9		667.3	667.3	667.4	0.1
E	12,600 [4]	113	147	3.4		671.3	671.3	671.4	0.1
Duck Creek									
A	310 [6]	42	198	3.8		609.6	595.9 [4]	596.0	0.1
B	400 [6]	34 [3]	117	6.5		609.6	595.9 [4]	596.0	0.1
C	520 [6]	34	154	4.9		609.6	597.1 [4]	597.1	0.0
D	1,400 [6]	118	458	1.7		609.6	599.0 [4]	599.1	0.1

[1]Feet Above confluence with Burns Ditch [2]See Explanation in Section 4.2 Floodways [3]Computed floodway width (Actual floodway width designated by IDNR); See explanation in Section 4.2
[4]Feet Above Mouth [5]Section area and mean velocity computed without floodway modification [6]Feet above confluence with Deep River

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Deep River, Deer Creek, Dinwiddie Ditch, Duck Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[5] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Duck Creek									
E	1,510 [1]	16 [3]	74	10.3		609.6	599.0 [4]	599.1	0.1
F	1,820 [1]	177	987	0.8		609.6	601.5 [4]	601.6	0.1
G	2,300 [1]	68	157	4.8		609.6	602.2 [4]	602.2	0.0
H	2,830 [1]	154	384	2.0		609.6	603.1 [4]	603.2	0.1
I	2,940 [1]	16 [3]	119	6.4		609.6	603.6 [4]	603.6	0.0
J	3,075 [1]	10 [3]	78	9.8		609.6	605.0 [4]	605.0	0.0
K	3,330 [1]	186	1,842	0.4		609.6	606.9 [4]	606.9	0.0
L	3,380 [1]	20 [3]	201	3.8		609.6	606.9 [4]	606.9	0.0
M	3,558 [1]	253	2,792	0.3		609.6	608.3 [4]	608.4	0.1
N	6,108 [1]	280	2,584	0.3		609.6	608.3 [4]	608.4	0.1
O	9,368 [1]	164	915	0.8		609.6	608.5 [4]	608.6	0.1
P	12,818 [1]	20 [3]	116	6.6		609.6	609.5 [4]	609.6	0.1
Q	12,993 [1]	151	611	1.2		610.8	610.8	610.9	0.1
R	14,413 [1]	212	589	1.2		611.4	611.4	611.5	0.1
S	14,463 [1]	20 [3]	125	5.7		611.4	611.4	611.5	0.1
Dyer Ditch									
A	1,172 [2]	19	133	5.9		618.5	613.3 [6]	613.4	0.1
B	2,117 [2]	24	154	5.1		618.5	615.6 [6]	615.7	0.1
C	5,037 [2]	26	129	3.6		618.5	618.2 [6]	618.3	0.1
D	7,355 [2]	24	133	3.5		623.3	623.3	623.2	0.0
E	9,071 [2]	25	154	5.3		625.1	625.1	625.1	0.0
F	11,088 [2]	22	106	3.3		627.8	627.8	627.8	0.0
G	11,357 [2]	32	145	2.4		631.2	631.2	631.2	0.0

[1]Feet above confluence with Deep River [2]Feet above confluence with Hart Ditch [3]Computed floodway width (Actual floodway width designated by IDNR) [4]Elevations computed without consideration of backwater effects from Deep River [5]See Explanation in Section 4.2 Floodways [6]Elevations computed without consideration of backwater effects from Hart Ditch

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Duck Creek, Dyer Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[3] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dyer Ditch									
H	14,108 [2]	52	157	2.2		634.5	634.5	634.6	0.1
I	17,688 [2]	37	207	1.7		637.4	637.4	637.4	0.0
J	18,491 [2]	353	700	0.4		637.6	637.6	637.7	0.1
K	18,723 [2]	473	759	0.4		638.3	638.3	638.4	0.0
Foss Ditch									
A	1,000 [1]	270	650	1.4		689.5	689.5	689.6	0.1
B	2,100 [1]	259	530	1.4		691.8	691.8	691.9	0.1
C	4,500 [1]	132	270	2.7		697.4	697.4	697.5	0.1
D	7,200 [1]	68	283	2.6		703.1	703.1	703.2	0.1
E	8,950 [1]	1,170	10,036	0.1		703.2	703.2	703.3	0.1
F	10,200 [1]	566	4,911	0.1		703.2	703.2	703.3	0.1
G	12,600 [1]	1,475	3,943	0.2		703.2	703.2	703.3	0.1
H	14,720 [1]	668	2,233	0.1		703.2	703.2	703.3	0.1
I	16,070 [1]	458	1,920	0.1		703.2	703.2	703.3	0.1
Grand Calumet River									
A	15,048 [1]	77	402	1.2		582.1	582.1	582.2	0.1
B	15,734 [1]	108	481	1.0		582.2	582.2	582.3	0.1
C	15,972 [1]	85	425	1.1		582.2	582.2	582.3	0.1
D	16,880 [1]	92	440	1.1		583.2	583.2	583.3	0.1
E	18,168 [1]	88	424	1.1		583.3	583.3	583.4	0.1
F	18,411 [1]	101	595	0.8		583.9	583.9	583.9	0.1

[1]Feet above mouth [2]Feet above confluence with Hart Ditch [3]See Explanation in Section 4.2

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Dyer Ditch, Foss Ditch, Grand Calumet River

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[4] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Grand Calumet River									
G	19,910	120	571	0.5		583.9	583.9	584.0	0.1
H	21,991	143	606	0.5		583.9	583.9	584.0	0.1
I [2]	23,304	172	632	0.6		584.8	583.4 [3]	583.5	0.0
J [2]	25,695	781	1,813	0.2		584.8	583.3 [3]	583.3	0.0
K [2]	28,992	160	424	0.9		584.8	583.2 [3]	583.2	0.0
L [2]	29,754	157	382	1.1		584.8	583.1 [3]	583.1	0.0
M [2]	31,455	96	415	1.0		584.8	582.9 [3]	583.0	0.1
N	33,850	601	3,119	1.2		585.0	585.0	585.1	0.1
O	36,659	220	2,304	1.6		585.3	585.3	585.4	0.1
P	38,845	735	4,066	0.9		585.4	585.4	585.6	0.1
Q	41,015	239	1,783	2.0		585.6	585.6	585.8	0.1
R	43,101	469	4,077	0.9		585.9	585.9	586.1	0.1
S	45,772	264	1,868	1.9		586.2	586.2	586.3	0.1
T	46,068	172	1,664	2.0		586.2	586.2	586.4	0.1
U	46,374	114	925	3.7		586.2	586.2	586.4	0.1
V	49,025	209	1,678	2.0		587.1	587.1	587.2	0.1
W	50,831	377	2,557	1.3		587.3	587.3	587.4	0.1
X	53,080	930	3,207	0.8		587.4	587.4	587.5	0.1
Y	54,896	394	2,396	1.1		587.5	587.5	587.6	0.1
Z	57,204	120	979	2.7		587.8	587.8	587.9	0.1

[1]Feet Above Mouth Feet [2]East-Flowing to Indiana Harbor Canal [3]Elevation not including backwater from Indiana Harbor Canal [4]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Grand Calumet River

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Grand Calumet River									
AA	58,729	314	1,752	1.4		588.1	588.1	588.2	0.1
AB	59,463	376	3,104	0.8		588.8	588.8	588.9	0.1
AC	61,892	203.81	1,712	1.5		588.8	588.8	589.0	0.1
AD	64,474	163.53	1,657	1.5		589.0	589.0	589.1	0.1
AE	65,625	187.71	1,505	1.2		589.1	589.1	589.2	0.1
AF	68,413	292.9	2,214	0.8		589.2	589.2	589.3	0.1
AG	69,854	139.89	1,261	1.5		589.2	589.2	589.4	0.1
AH	70,831	114.32	1,110	1.6		589.3	589.3	589.5	0.1
AI	71,977	66.71	697	1.7		589.4	589.4	589.5	0.1
AJ	72,362	98.36	945	1.2		589.5	589.5	589.6	0.1
AK	73,857	107.98	988	1.2		589.5	589.5	589.7	0.1
AL	75,805	73.2	861	1.4		589.6	589.6	589.7	0.1
AM	77,146	64.71	539	2.2		589.7	589.7	589.8	0.1
AN	77,827	61.43	472	2.5		589.9	589.9	590.0	0.1
AO	79,274	53.21	335	0.6		590.6	590.6	590.7	0.1
AP	79,944	57.16	340	0.6		590.6	590.6	590.7	0.1
AQ	82,759	53.31	298	0.7		590.6	590.6	590.8	0.1
AR	84,601	24.61	100	0.1		590.7	590.7	590.8	0.1
AS	85,647	36.01	189	0.0		590.7	590.7	590.8	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Grand Calumet River

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Griesel Ditch									
A	29,280	362	518	1.4		648.5	648.5	648.6	0.1
B	31,980	204	308	2.2		656.0	656.0	656.1	0.1
C	34,490	681	645	1.0		661.0	661.0	661.1	0.1
D	36,520	473	840	0.7		666.3	666.3	666.4	0.1
E	38,500	162	306	1.9		672.9	672.9	673.0	0.1
F	40,480	93	253	2.3		678.8	678.8	678.9	0.1
G	42,260	447	588	0.9		680.8	680.8	680.9	0.1
H	44,270	634	488	1.0		685.8	685.8	685.9	0.1
I	45,470	212	277	1.7		689.9	689.9	690.0	0.1
J	47,050	35	103	3.6		698.0	698.0	698.1	0.1
K	49,030	85	134	2.5		709.1	709.1	709.2	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Griesel Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Hart Ditch									
A	671	79	667	5.2		599.1	599.1	599.1	0.0
B	2,376	68	548	6.3		599.4	599.4	599.5	0.0
C	3,374	68	789	4.8		601.8	601.8	601.8	0.1
D	4,029	63	648	6.0		602.8	602.8	602.9	0.0
E	5,264	100	852	5.1		605.1	605.1	605.1	0.1
F	6,162	79	841	3.6		606.2	606.2	606.3	0.1
G	9,145	76	834	3.7		608.8	608.8	608.9	0.1
H	9,752	103	893	3.8		609.3	609.3	609.3	0.1
I	10,945	77	993	2.9		610.7	610.7	610.8	0.1
J	13,876	70	871	3.3		615.1	615.1	615.2	0.1
K	15,317	83	1,153	2.5		617.3	617.3	617.4	0.1
L	15,645	104	1,317	2.4		617.6	617.6	617.7	0.1
M	17,968	70	898	3.2		618.2	618.2	618.2	0.1
N	18,274	135	1,478	2.0		618.4	618.4	618.4	0.1
O	19,383	112	1,097	2.8		618.4	618.4	618.5	0.1
P	21,875	66	584	3.9		618.8	618.8	618.9	0.1
Q	24,378	58	471	4.5		620.1	620.1	620.2	0.1
R	24,874	55	557	4.0		622.9	622.9	623.1	0.1
S	26,030	111	1,302	1.6		624.7	624.7	624.8	0.1
T	27,889	80	812	2.6		626.8	626.8	626.9	0.1
U	28,105	83	809	2.6		627.5	627.5	627.6	0.1
V	28,338	68	732	2.8		628.2	628.2	628.3	0.1
W	28,887	59	696	2.9		629.7	629.7	629.9	0.1

[1]Feet above confluence with Little Calumet River [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Hart Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[4] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Hart Ditch									
X	29,753 [1]	83	734	2.8		631.4	631.4	631.5	0.1
Y	30,381 [1]	55	607	3.3		633.0	633.0	633.1	0.1
Z	32,023 [1]	116	933	2.2		635.1	635.1	635.2	0.1
AA	33,174 [1]	601	2,292	1.1		636.3	636.3	636.4	0.1
Indiana Harbor Canal									
A	301 [2]	355	11,704	0.4		583.9	579.5 [3]	579.6	0.1
B	1,991 [2]	350	11,409	0.4		583.9	579.5 [3]	579.6	0.1
C	3,791 [2]	64	2,125	2.3		583.9	579.5 [3]	579.6	0.1
D	3,839 [2]	66	2,065	2.3		583.9	579.5 [3]	579.6	0.1
E	3,902 [2]	66	2,216	2.2		583.9	579.5 [3]	579.6	0.1
F	3,928 [2]	66	2,216	2.2		583.9	579.5 [3]	579.6	0.1
G	4,002 [2]	66	2,239	2.2		583.9	579.5 [3]	579.6	0.1

[1]Feet above confluence with Little Calumet River [2]Feet Above Mouth [3]Elevations without considering backwater effect from Lake Michigan [4]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Hart Ditch, Indiana Harbor Canal

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY[3]	WITH FLOODWAY	INCREASE
Indiana Harbor Canal									
H	4,066	66	1,981	2.4		583.9	579.5	579.6	0.1
I	4,678	229	4,339	1.1		583.9	579.5	579.6	0.1
J	5,333	70	2,240	2.1		583.9	579.5	579.6	0.1
K	5,359	70	2,239	2.2		583.9	579.5	579.6	0.1
L	6,009	280	7,116	0.7		583.9	579.6	579.7	0.1
M	6,579	236	5,135	0.9		583.9	579.6	579.7	0.1
N	6,706	344	6,593	0.7		583.9	579.6	579.7	0.1
O	7,799	474	7,747	0.6		583.9	579.6	579.7	0.1
P	9,113	894	20,211	0.2		583.9	579.6	579.7	0.1
Q	9,736	272	5,632	0.9		583.9	579.6	579.7	0.1
R	10,032	94	1,901	2.5		583.9	579.6	579.7	0.1
S	10,116	68	1,898	2.5		583.9	579.6	579.7	0.1
T	10,153	73	2,229	2.2		583.9	579.7	579.8	0.1
U	10,423	200	5,306	0.9		583.9	579.7	579.8	0.1
V	11,009	200	5,712	0.8		583.9	579.7	579.8	0.1
W	11,774	224	6,023	0.7		583.9	579.7	579.8	0.1
X	12,778	300	6,260	0.6		583.9	579.7	579.8	0.1
Y	13,638	200	3,498	1.2		583.9	579.7	579.8	0.1
Z	13,818	169	956	4.2		583.9	579.7	579.8	0.1
AA	13,923	167	832	4.8		583.9	579.7	579.8	0.1
AB	14,921	133	821	4.9		583.9	580.6	580.7	0.1
AC	15,988	160	1,063	3.8		583.9	581.4	581.4	0.1
AD	16,980	94	866	4.6		583.9	582.2	582.3	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]Elevations without considering backwater effect from Lake Michigan

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Indiana Harbor Canal

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Indiana Harbor Canal									
AE	17,049 [1]	140	798	5.0		583.9	582.3 [3]	582.4	0.1
AF	17,487 [1]	94	764	5.2		583.9	582.6 [3]	582.7	0.1
AG	17,593 [1]	132	1,007	4.0		583.9	582.9 [3]	583.0	0.1
AH	18,300 [1]	349	1,400	2.9		583.9	583.3 [3]	583.4	0.1
AI	18,987 [1]	153	1,181	3.4		583.9	583.5 [3]	583.6	0.1
AJ	19,969 [1]	185	1,337	3.0		583.9	583.9 [3]	584.0	0.1
AK	20,460 [1]	154	1,137	3.4		584.0	584.0	584.1	0.1
AL	20,555 [1]	160	1,232	3.3		584.0	584.0	584.1	0.1
AM	21,178 [1]	76	552	7.3		584.0	584.0	584.1	0.1
AN	21,236 [1]	120	988	4.1		584.5	584.5	584.6	0.1
AO	21,331 [1]	234	1,294	3.1		584.8	584.8	584.9	0.1
Kaiser Ditch									
A	0 [7]	500 [5]	290 [4]	1.3 [4]		620.9	616.1 [6]	616.2	0.1
B	772 [7]	369	1,718 [4]	0.2 [4]		622.9	622.9	622.9	0.0
C	1,432 [7]	180 [5]	101 [4]	3.5 [4]		622.9	622.9	622.9	0.0
D	1,592 [7]	140	856 [4]	0.4 [4]		625.7	625.7	625.7	0.0
E	2,082 [7]	256	2,434 [4]	0.1 [4]		625.7	625.7	625.7	0.0
F	2,622 [7]	104	574 [4]	0.6 [4]		625.7	625.7	625.7	0.0
G	3,319 [7]	235	627 [4]	0.4 [4]		627.2	627.2	627.2	0.0

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]Elevations without considering backwater effect from Lake Michigan [4]Computed without floodway modification
[5]Floodway width modified to satisfy IDNR requirements [6]Elevation computed without considering backwater effects from Turkey Creek [7]Feet above confluence with Turkey Creek

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Indiana Harbor Canal, Kaiser Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Kaiser Ditch									
H	3,578 [1]	420	2,240 [4]	0.1 [4]		627.2	627.2	627.2	0.0
I	5,118 [1]	480 [5]	64 [4]	4.3 [4]		627.2	627.2	627.2	0.0
J	5,592 [1]	163	401 [4]	0.7 [4]		627.9	627.9	627.9	0.0
Lake George Canal									
A	591 [3]	200	6,016	0.0		583.9	579.7 [7]	579.8	0.1
B	1,552 [3]	200	5,247	0.0		583.9	579.7 [7]	579.8	0.1
C	2,592 [3]	202	3,955	0.1		583.9	579.7 [7]	579.8	0.1
D	2,767 [3]	250	5,556	0.0		583.9	579.7 [7]	579.8	0.1
E	3,765 [3]	250	4,700	0.0		583.9	579.7 [7]	579.8	0.1
F	4,826 [3]	201	3,062	0.1		583.9	579.7 [7]	579.8	0.1
G	4,873 [3]	261	2,523	0.1		583.9	579.7 [7]	579.8	0.1
H	5,201 [3]	289	3,758	0.1		583.9	579.7 [7]	579.8	0.1
Main Beaver Dam Ditch									
A	139,075 [8]	308	994	1.4		676.3	676.3	676.4	0.1
B	141,609 [8]	187	777	1.8		677.1	677.1	677.2	0.1
C	143,405 [8]	250	905	1.6		677.8	677.8	677.9	0.1
D	144,461 [8]	880	2,558	0.6		678.1	678.1	678.2	0.1

[1]Feet Above Confluence with Turkey Creek [2]See Explanation in Section 4.2 Floodways [3]Feet above confluence with Indiana Harbor Canal [4]Computed without floodway modifictaion
[5]Floodway width modified to satisfy IDNR requirements [6]Elevation computed without considering backwater effects from Turkey Creek
[7]Elevation computed without considering backwater effect from Lake Michigan [8]Feet above mouth

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Kaiser Ditch, Lake George Canal, Main Beaver Dam Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Main Beaver Dam Ditch									
E	146,995	63	292	4.4		678.5	678.5	678.6	0.1
F	147,312	33	256	5.0		679.0	679.0	679.1	0.1
G	148,012	45	329	3.9		680.6	680.6	680.6	0.0
H	149,252	45	430	2.8		681.7	681.7	681.8	0.1
I	149,312	42	338	3.5		681.7	681.7	681.8	0.1
J	150,362	123	443	2.7		682.9	682.9	683.0	0.1
K	150,644	100	377	3.2		683.3	683.3	683.4	0.1
L	152,164	57	382	3.1		684.1	684.1	684.2	0.1
M	153,024	59	386	2.9		684.9	684.9	685.0	0.1
N	154,924	85	457	2.4		686.4	686.4	686.5	0.1
O	155,254	46	375	2.9		686.6	686.6	686.6	0.0
P	155,444	84	490	2.2		686.8	686.8	686.8	0.0
Q	156,254	567	1,880	0.6		687.0	687.0	687.1	0.1
R	158,274	32	265	4.0		687.3	687.3	687.3	0.0
S	158,334	46	356	2.9		687.3	687.3	687.4	0.1
T	158,444	445	929	1.1		687.6	687.6	687.6	0.0
U	158,724	44	430	2.4		687.7	687.7	687.7	0.0
V	158,822	354	785	1.2		687.8	687.8	687.8	0.0
W	159,720	507	935	1.0		688.0	688.0	688.0	0.0
X	162,466	189	921	1.1		688.6	688.6	688.6	0.0
Y	163,469	300	875	1.1		688.7	688.7	688.8	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA
AND INCORPORATED AREAS

FLOODWAY DATA

Main Beaver Dam Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Main Beaver Dam Ditch									
Z	163,680	191	647	1.5		688.7	688.7	688.8	0.1
AA	165,686	1,033	5,431	0.2		689.4	689.4	689.5	0.1
AB	166,478	1,769	12,417	0.1		689.5	689.5	689.6	0.1
AC	169,171	1,775	7,065	0.1		689.5	689.5	689.6	0.1
AD	171,389	298	398	1.0		690.3	690.3	690.4	0.1
AE	173,026	214	1,607	0.2		691.2	691.2	691.3	0.1
AF	174,451	783	2,899	0.1		691.2	691.2	691.3	0.1
AG	175,296	1,492	6,775	0.1		691.2	691.2	691.3	0.1
AH	177,619	40	224	1.5		692.2	692.2	692.3	0.1
AI	179,203	337	2,467	0.1		692.5	692.5	692.6	0.1
AJ	180,787	187	839	0.4		692.8	692.8	692.9	0.1
AK	182,318	908	5,143	0.1		692.8	692.8	692.9	0.1
AL	184,642	452	1,582	0.2		692.8	692.8	692.9	0.1
AM	186,859	25	88	2.6		699.9	699.9	700.0	0.1
Main Beaver Dam Ditch Tributary BE									
A	560	213	501	0.7		678.2	678.2	678.3	0.1
B	3,160	61	140	2.6		683.0	683.0	683.1	0.1
C	4,580	62	140	2.5		685.5	685.5	685.6	0.1

[1]Feet above mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Main Beaver Dam Ditch, Main Beaver Dam Ditch Tributary BE

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Main Beaver Dam Ditch Tributary BE									
D	6,040	69	124	2.8		688.7	688.7	688.8	0.1
E	7,040	372	1,034	0.3		689.9	689.9	690.0	0.1
F	8,360	152	307	1.1		690.4	690.4	690.5	0.1
G	9,560	760	1,915	0.2		690.4	690.4	690.5	0.1
H	10,160	409	2,153	0.1		700.5	700.5	700.6	0.1
Main Beaver Dam Ditch Tributary BL									
A	1,525	130	321	1.7		690.5	690.5	690.6	0.1
B	3,250	1,976	13,529	0.0		691.0	691.0	691.1	0.1
C	4,625	3,411	25,935	0.0		691.0	691.0	691.1	0.1
D	5,650	305	2,599	0.1		691.0	691.0	691.1	0.1
E	7,050	795	4,559	0.1		691.0	691.0	691.1	0.1
F	8,000	519	2,994	0.1		691.9	691.9	692.0	0.1
G	9,075	38	158	1.4		692.4	692.4	692.5	0.1
Main Beaver Dam Ditch Tributary BN									
A	2,200	1,464	12,025	0.0		691.0	691.0	691.1	0.1
B	3,975	306	427	0.7		691.7	691.7	691.8	0.1
C	5,525	120	356	0.8		693.0	693.0	693.1	0.1
D	8,075	787	6,319	0.0		693.0	693.0	693.1	0.1
E	10,225	614	3,894	0.1		693.0	693.0	693.1	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Main Beaver Dam Ditch Tributaries BE, BL, BN

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Main Beaver Dam Ditch Tributary BV									
A	1,000	333	2,297	0.1		689.5	689.5	689.6	0.1
B	2,650	298	1,558	0.2		689.5	689.5	689.6	0.1
C	3,800	141	499	0.6		689.6	689.6	689.7	0.1
D	4,800	40	185	1.5		690.0	690.0	690.1	0.1
E	5,900	656	3,257	0.1		690.1	690.1	690.2	0.1
F	6,850	1,192	6,556	0.0		690.1	690.1	690.2	0.1
G	8,150	813	2,934	0.1		690.1	690.1	690.2	0.1
H	9,100	1,992	7,734	0.0		690.3	690.3	690.4	0.1
I	10,700	271	957	0.2		690.4	690.4	690.5	0.1
Main Beaver Dam Ditch Tributary LP									
A	400	44	202	1.4		688.0	688.0	688.1	0.1
B	1,650	247	681	0.4		688.2	688.2	688.3	0.1
C	2,400	223	353	0.8		690.5	690.5	690.6	0.1
D	3,700	299	617	0.5		690.7	690.7	690.8	0.1
E	4,900	72	229	1.3		691.0	691.0	691.1	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Main Beaver Dam Ditch Tributaries BV, LP

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Main Beaver Dam Ditch South Tributary									
A	0 [1]	150	103	3.2		693.8	693.8	693.9	0.1
B	100 [1]	224	1,592	0.2		694.0	694.0	694.1	0.1
C	1,482 [1]	131	183	1.7		694.0	694.0	694.1	0.1
D	1,611 [1]	249	1,311	0.2		694.1	694.1	694.2	0.1
E	2,370 [1]	202	559	0.6		694.1	694.1	694.2	0.1
F	2,517 [1]	111	463	0.7		694.1	694.1	694.2	0.1
G	3,947 [1]	90	91	2.7		694.1	694.1	694.2	0.1
H	4,905 [1]	658	5,824	0.1		695.2	695.2	695.3	0.1
McConnel Ditch									
A	630 [3]	97	503	1.3		671.7	671.7	671.8	0.1
B	1,830 [3]	83	429	1.5		672.2	672.2	672.3	0.1
C	2,410 [3]	120	537	1.2		672.5	672.5	672.6	0.1
D	3,910 [3]	688	2,000	0.3		673.1	673.1	673.2	0.1
E	5,270 [3]	1,176	5,117	0.1		673.2	673.2	673.3	0.1
F	11,180 [3]	150	215	1.9		681.4	681.4	681.5	0.1

[1]Feet above Summit Street [2]See Explanation in Section 4.2 Floodways [3]Feet above mouth

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Main Beaver Dam Ditch South Tributary, McConnel Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[5] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Meadowdale Lateral									
A	150 [1]	920 [2]	302 [3]	1.7 [3]		620.2	616.7 [4]	616.8	0.1
B	830 [1]	106	330 [3]	1.6 [3]		620.2	617.1 [4]	617.2	0.1
C	932 [1]	90 [2]	79 [3]	6.6 [3]		620.2	617.1 [4]	617.2	0.1
D	1,099 [1]	140 [2]	217 [3]	2.4 [3]		620.2	618.3 [4]	618.3	0.0
E	1,349 [1]	214	1,152 [3]	0.5 [3]		620.2	618.4 [4]	618.4	0.0
F	1,769 [1]	119	264 [3]	2.0 [3]		620.2	618.4 [4]	618.4	0.0
G	2,097 [1]	338	1,775 [3]	0.3 [3]		623.5	623.5	623.5	0.0
H	2,297 [1]	268	1,738 [3]	0.3 [3]		624.5	624.5	624.5	0.0
I	2,957 [1]	171	939 [3]	0.5 [3]		624.5	624.5	624.5	0.0
J	3,126 [1]	221	1,209 [3]	0.4 [3]		624.5	624.5	624.5	0.0
K	3,686 [1]	237	954 [3]	0.5 [3]		624.5	624.5	624.5	0.0
L	3,925 [1]	145	568 [3]	0.8 [3]		624.5	624.5	624.5	0.0
M	4,325 [1]	205 [2]	45 [3]	10.0 [3]		624.5	624.5	624.5	0.0
New Elliot Tributary									
A	900 [6]	92	238	1.1		625.9	625.9	625.9	0.0
B	2,470 [6]	48	206	1.3		629.9	629.9	629.9	0.0
C	3,430 [6]	45	125	2.0		630.4	630.4	630.4	0.0
D	4,720 [6]	700	2,453	0.1		639.6	639.6	639.7	0.1
E	5,900 [6]	259	473	0.5		640.2	640.2	640.3	0.1

[1]Feet above confluence with Turkey Creek [2]Floodway width modified to satisfy IDNR requirements; See explanation in Section 4.2 Floodways [3]Computed without floodway modification
[4]Elevation computed without considering backwater effects from Turkey Creek [5]See Explanation in Section 4.2 Floodways [6]Feet above mouth

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Meadowdale Lateral, New Elliot Tributary

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Niles Ditch									
A	1,500	794	6,421	0.1		675.9	675.9	676.0	0.1
B	4,300	308	1,132	0.6		676.2	676.2	676.3	0.1
C	6,000	117	394	1.6		677.4	677.4	677.5	0.1
D	7,250	404	2,325	0.3		678.0	678.0	678.1	0.1
E	8,950	1,055	9,013	0.1		678.1	678.1	678.2	0.1
F	10,300	213	725	0.8		678.4	678.4	678.5	0.1
G	11,050	450	2,403	0.2		678.5	678.5	678.6	0.1
H	13,300	863	3,478	0.2		678.8	678.8	678.9	0.1
I	15,470	1,211	8,987	0.1		678.8	678.8	678.9	0.1
J	17,470	1,455	7,178	0.1		678.8	678.8	678.9	0.1
K	19,470	822	6,066	0.0		678.8	678.8	678.9	0.1
L	21,970	1,521	7,762	0.0		678.8	678.8	678.9	0.1
M	23,070	876	1,951	0.1		678.8	678.8	678.9	0.1
N	26,100	936	5,124	0.0		678.8	678.8	678.9	0.1
Niles Ditch Tributary NS									
A	1,300	897	6,487	0.0		678.8	673.9[3]	674.0	0.1
B	2,720	150	5,881	0.1		678.8	678.8	678.9	0.1
C	4,220	40	100	2.7		684.2	684.2	684.3	0.1
D	5,720	34	84	3.1		690.2	690.2	690.3	0.1
E	7,140	103	126	2.0		696.0	696.0	696.1	0.1
F	7,540	82	146	1.7		697.5	697.5	697.6	0.1
G	9,240	84	140	1.6		702.7	702.7	702.8	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]Elevations without considering backwater effect from Niles Ditch

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Niles Ditch, Niles Ditch Tributary NS

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Niles Ditch Tributary NT									
A	1,650	672	4,722	0.1		678.8	675.1 [3]	675.2	0.1
B	4,250	339	1,385	0.2		678.8	675.8 [3]	675.9	0.1
C	6,100	329	925	0.2		678.9	678.9	679.0	0.1
D	7,600	174	185	1.1		680.9	680.9	681.0	0.1
Redwing Tributary									
A	1,500	604	532	0.9		651.0	651.0	651.1	0.1
B	3,600	142	248	2.2		660.9	660.9	661.0	0.1
C	5,050	89	374	1.3		665.5	665.5	665.6	0.1
D	6,400	75	227	2.2		669.9	669.9	670.0	0.1
E	7,900	156	279	1.7		675.0	675.0	675.1	0.1
Schererville Ditch									
A	2,520 [4]	25	81	3.2		623.9	623.9	624.0	0.1
B	3,570 [4]	32	139	1.9		624.8	624.8	624.9	0.1
C	4,670 [4]	44	136	2.0		625.3	625.3	625.4	0.1
D	5,445 [4]	1,247	1,009	0.7		627.3	627.3	627.4	0.1
E	6,265 [4]	1,706	1,825	0.1		627.8	627.6	627.7	0.1
F	7,380 [4]	343	206	0.4		628.2	628.2	628.3	0.1
G	8,620 [4]	1,141	462	0.2		628.3	628.3	628.4	0.1
H	9,510 [4]	30	82	0.8		628.4	628.4	628.5	0.1
I	10,310 [4]	23	55	1.0		629.3	629.3	629.4	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]Elevations without considering backwater effect from Niles Ditch [4]Feet above confluence with Dyer Ditch

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Niles Ditch Tributary NT, Redwing Tributary, Schererville Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Schererville Ditch									
J	11,020 [1]	25	61	0.9		630.0	630.0	630.1	0.1
K	12,400 [1]	30	70	1.0		630.5	630.5	630.6	0.1
L	12,990 [1]	58	98	0.6		630.6	630.6	630.7	0.1
Schilling Ditch									
A	1,790 [3]	364	273	1.0		628.1	628.1	628.2	0.1
B	2,590 [3]	370	141	0.5		629.6	629.6	629.6	0.0
C	4,320 [3]	124	226	1.2		636.7	636.7	636.8	0.1
D	5,170 [3]	808	3,234	0.1		636.7	636.7	636.8	0.1
E	5,720 [3]	600	2,398	0.1		636.7	636.7	636.8	0.1
F	6,840 [3]	113	288	0.9		637.1	637.1	637.2	0.1
G	7,840 [3]	511	2,261	0.1		637.1	637.1	637.2	0.1
H	9160 [3]	799	2,768	0.1		637.2	637.2	637.3	0.1
I	10510 [3]	24	50	4.3		644.4	644.4	644.5	0.1
J	12290 [3]	26	66	3.2		652.6	652.6	652.7	0.1
K	14290 [3]	142	255	0.8		663.3	663.3	663.3	0.0

[1]Feet above confluence with Dyer Ditch [2]See Explanation in Section 4.2 Floodways [3]Feet above mouth

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Schererville Ditch, Schilling Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Schoon Ditch									
A	111	21	56	5.4		606.5	597.5 [3]	597.6	0.1
B	1,410	16	48	6.2		606.5	602.9 [3]	602.9	0.0
C	2,492	22	79	3.8		606.5	605.7 [3]	605.7	0.0
D	3,812	12	71	4.2		608.3	608.3	608.3	0.0
E	4,414	30	94	3.2		608.9	608.9	609.0	0.1
F	6,152	15	73	4.1		611.2	611.2	611.3	0.1
G	7,635	11	51	3.0		613.7	613.7	613.8	0.1
H	8,707	27	95	1.6		614.2	614.2	614.3	0.1
Seberger Ditch									
A	19,029	460	476	0.9		620.9	620.9	621.0	0.1
B	19,932	845	658	0.7		621.6	621.6	621.7	0.1
C	21,157	1078	2,225	0.2		623.1	623.1	623.2	0.1
D	22,414	649	2,626	0.2		623.1	623.1	623.2	0.1
E	23,375	37	112	3.6		623.1	623.1	623.2	0.1
F	24,293	1,081	3,083	0.1		627.5	627.5	627.5	0.0
G	25,545	90	271	1.3		627.8	627.8	627.8	0.0
H	27,250	162	402	0.8		629.3	629.3	629.4	0.1
I	28,549	4,019	10,202	0.1		629.3	629.3	629.4	0.1
J	29,953	1,352	3,312	0.1		629.3	629.3	629.4	0.1
K	31,036	20	63	3.2		629.3	629.3	629.3	0.1
L	31,849	26.97	102	1.9		630.3	630.3	630.5	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]Elevations without considering backwater effect from Hart Ditch

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA
AND INCORPORATED AREAS

FLOODWAY DATA

Schoon Ditch, Seberger Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Singleton Ditch									
A	112,540	1,174	1,232	1.2		650.9	650.9	651.0	0.1
B	115,040	455	1,170	1.3		654.2	654.2	654.3	0.1
C	118,280	675	1,754	0.9		656.1	656.1	656.2	0.1
D	120,870	591	944	1.6		659.1	659.1	659.2	0.1
Spring Run									
A	5,060	646	956	1.1		647.1	647.1	647.2	0.1
B	6,540	290	403	2.4		651.6	651.6	651.7	0.1
C	7,730	280	714	1.3		653.1	653.1	653.2	0.1
D	9,630	94	263	3.6		661.4	661.4	661.5	0.1
E	10,370	170	797	1.2		663.3	663.3	663.4	0.1
F	11,490	60	227	4.2		666.7	666.7	666.8	0.1
G	13,840	121	343	2.7		673.7	673.7	673.8	0.1
H	15,090	446	729	1.3		674.9	674.9	675.0	0.1
I	16,960	681	925	1.0		676.7	676.7	676.8	0.1
J	19,230	284	497	1.7		682.6	682.6	682.7	0.1
K	20,850	258	626	1.3		685.7	685.7	685.8	0.1
L	23,090	154	352	2.2		689.3	689.3	689.4	0.1
M	24,240	170	377	2.0		691.5	691.5	691.6	0.1
N	26,300	207	363	1.8		697.4	697.4	697.5	0.1
O	27,700	107	314	2.0		699.5	699.5	699.6	0.1
P	29,930	111	263	2.3		709.8	709.8	709.9	0.1
Q	31,830	425	456	1.2		714.7	714.7	714.8	0.1
R	33,920	71	269	1.9		721.3	721.3	721.4	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Singleton Ditch, Spring Run

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Spring Run									
S	36,020	99	260	1.8		727.2	727.2	727.3	0.1
T	38,920	463	794	0.5		728.3	728.3	728.4	0.1
Spring Street Ditch									
A	1,368	75	340	1.4		612.6	612.6	612.7	0.1
B	2,228	101	401	1.2		613.5	613.5	613.6	0.1
C	3,443	103	399	1.2		615.6	615.6	615.7	0.1
D	5,201	53	225	2.1		617.2	617.2	617.3	0.1
E	6,727	67	230	2.0		618.4	618.4	618.5	0.1
F	8,258	66	302	0.7		620.5	620.5	620.6	0.1
G	10,016	81	287	1.9		621.6	621.6	621.7	0.1
Sprout Ditch									
A	5,300	223	390	1.2		616.0	616.0	616.1	0.1
B	7,550	353	352	1.1		619.7	619.7	619.8	0.1
C	10,480	138	285	1.3		631.1	631.1	631.2	0.1
D	12,030	38	142	2.5		635.4	635.4	635.5	0.1
E	13,480	53	77	3.5		641.0	641.0	641.1	0.1
F	15,480	176	423	0.6		652.2	652.2	652.3	0.1
G	17,430	452	1,552	0.2		656.4	656.4	656.5	0.1
H	20,330	147	197	1.2		660.5	660.5	660.6	0.1
I	22,790	194	103	1.6		668.1	668.1	668.2	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Spring Run, Spring Street Ditch, Sprout Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sprout Ditch Tributary SU									
A	700	111	148	1.5		619.5	619.5	619.6	0.1
B	1,950	69	122	1.7		625.9	625.9	626.0	0.1
C	2,950	89	286	0.7		635.9	635.9	636.0	0.1
D	4,400	35	64	2.9		646.3	646.3	646.4	0.1
E	5,300	96	131	1.4		650.3	650.3	650.4	0.1
Sprout Ditch Tributary SV									
A	860	185	192	1.2		639.8	639.8	639.9	0.1
B	1,710	70	93	2.4		642.3	642.3	642.4	0.1
C	2,710	150	196	1.1		646.7	646.7	646.8	0.1
D	4,310	119	98	1.5		653.8	653.8	653.9	0.1
E	5,510	94	43	3.3		660.7	660.7	660.8	0.1
F	6,690	36	49	2.7		665.7	665.7	665.8	0.1
St. John Ditch									
A	600	140	249	1.6		675.6	675.6	675.7	0.1
B	1,130	85	140	2.9		677.9	677.9	678.0	0.1
C	1,680	100	164	2.4		679.7	679.7	679.8	0.1
D	3,726	63	439	0.9		686.5	686.5	686.4	0.1
E	4,066	420	3,708	0.1		691.2	691.2	691.1	0.1
F	4,586	415	2,388	0.2		691.2	691.2	691.1	0.1
G	5,116	320	2,115	0.2		691.2	691.2	691.1	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Sprout Ditch Tributaries SU, SV, St. John Ditch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
St. John Ditch									
H	5,326	170	679	0.5		691.3	691.3	691.1	0.1
I	5,526	180	798	0.4		691.3	691.3	691.1	0.1
J	5,826	445	3,828	0.1		693.5	693.5	693.4	0.1
K	6,156	410	5,198	0.1		693.5	693.5	693.4	0.1
L	6,946	1,565	13,576	0.0		693.5	693.5	693.4	0.1
M	8,426	630	4,988	0.1		693.5	693.5	693.4	0.1
N	9,626	780	6,131	0.1		693.5	693.5	693.4	0.1
Stony Run									
E	124,040	77	417	2.9		663.4	663.4	663.5	0.1
F	125,240	90	358	3.4		665.8	665.8	665.9	0.1
G	127,690	729	1,392	0.6		666.7	666.7	666.8	0.1
H	129,690	314	1,036	1.7		668.1	668.1	668.2	0.1
I	131,140	222	643	1.6		670.0	670.0	670.1	0.1
J	133,970	534	1,066	0.9		671.9	671.9	672.0	0.1
K	137,070	394	1,049	0.9		674.1	674.1	674.2	0.1
L	140,770	539	807	1.2		677.0	677.0	677.1	0.1
M	143,495	1,085	2,230	0.4		677.4	677.4	677.5	0.1
N	146,695	1,283	1,166	0.8		679.5	679.5	679.6	0.1
O	148,495	1,149	2,303	0.4		679.8	679.8	679.9	0.1
P	149,635	1,587	5,090	0.1		680.0	680.0	680.1	0.1
Q	150,685	241	826	0.8		687.3	687.3	687.4	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

St. John Ditch, Stony Run

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Stony Run									
R	152,585	388	552	1.3		691.6	691.6	691.7	0.1
S	153,875	129	229	2.7		695.3	695.3	695.4	0.1
T	156,275	40	167	3.5		705.6	705.6	705.7	0.1
U	158,435	466	756	0.7		708.7	708.7	708.8	0.1
V	159,735	1,216	4,857	0.1		708.8	708.8	708.9	0.1
W	161,975	427	1,167	0.3		708.9	708.9	709.0	0.1
Stony Run East Branch									
A	1,660	282	933	1.7		669.2	669.2	669.3	0.1
B	2,910	559	1,341	1.1		669.8	669.8	669.9	0.1
C	4,960	1,097	1,285	0.8		671.3	671.3	671.4	0.1
D	7,710	257	496	2.2		676.6	676.6	676.7	0.1
E	10,710	290	745	1.4		681.0	681.0	681.1	0.1
F	11,840	265	732	1.4		685.0	685.0	685.1	0.1
G	13,170	189	753	1.4		686.3	686.3	686.4	0.1
H	15,470	1,792	2,751	0.3		687.7	687.7	687.8	0.1
I	17,370	177	417	2.1		691.5	691.5	691.6	0.1
J	18,380	53	246	3.5		694.7	694.7	694.8	0.1
K	19,955	73	319	2.7		698.0	698.0	698.1	0.1
L	21,455	113	297	2.8		701.3	701.3	701.4	0.1
M	23,805	204	503	1.5		704.3	704.3	704.4	0.1
N	25,415	125	345	2.2		707.5	707.5	707.6	0.1
O	26,615	255	622	1.2		708.7	708.7	708.8	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Stony Run, Stony Run East Branch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Stony Run East Branch									
P	27,415	160	362	2.0		711.1	711.1	711.2	0.1
Q	28,640	100	316	2.3		713.4	713.4	713.5	0.1
R	29,590	150	450	1.6		715.3	715.3	715.4	0.1
S	31,940	95	291	2.2		718.1	718.1	718.2	0.1
Stony Run Middle Branch									
A	1,575	171	315	1.7		669.2	669.2	669.3	0.1
B	3,205	393	500	0.4		670.1	670.1	670.2	0.1
C	4,805	430	683	0.7		671.2	671.2	671.3	0.1
D	6,505	453	818	0.4		671.7	671.7	671.8	0.1
E	8,355	678	657	0.8		672.3	672.3	672.4	0.1
F	9,905	54	269	1.9		673.1	673.1	673.2	0.1
G	11,585	307	295	1.5		674.0	674.0	674.1	0.1
H	13,285	62	500	0.4		674.2	674.2	674.3	0.1
I	15,135	238	449	0.8		675.6	675.6	675.7	0.1
J	16,685	90	166	1.9		679.9	679.9	680.0	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Stony Run East Branch, Stony Run Middle Branch

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Stony Run Tributary ES									
A	1,200	846	4,051	0.2		687.5	687.5	687.6	0.1
B	3,100	585	624	0.8		688.6	688.6	688.7	0.1
C	4,000	836	146	3.0		694.4	694.4	694.5	0.1
Stony Run Tributary ET									
A	1,200	416	824	0.9		662.4	662.4	662.5	0.1
B	2,700	454	723	0.7		662.7	662.7	662.8	0.1
C	4,725	562	1,769	0.4		664.7	664.7	664.8	0.1
Turkey Creek									
A	0	572	7,268	0.3		612.9	612.9	612.9	0.0
B	1,901	280	3,266	1.0		612.9	612.9	612.9	0.0
C	6,304	319	2,866	1.5		613.0	613.0	613.1	0.1
D	6,558	341	3,060	1.5		613.1	613.1	613.1	0.0
E	7,334	1,015	9,032	0.5		613.1	613.1	613.2	0.1
F	10,491	51	570	3.9		613.0	613.0	613.1	0.1
G	10,729	65	667	3.6		613.3	613.3	613.4	0.1
H	11,120	460	2,713	1.2		613.5	613.5	613.7	0.2
I	12,841	300	653	4.5		613.6	613.6	613.7	0.1
J	15,154	219	1,388	2.9		615.0	615.0	615.2	0.2

[1]Feet above mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Stony Run Tributaries ES, ET, Turkey Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Turkey Creek									
K	17,318	526	2,894	1.2		615.3	615.3	615.4	0.1
L	18,454	56	383	5.7		615.4	615.4	615.5	0.2
M	20,449	421	1,885	2.0		617.8	617.8	617.8	0.0
N	21,986	58	444	4.1		617.9	617.9	617.9	0.0
O	22,356	51	267	7.1		618.7	618.7	618.8	0.1
P	22,651	394	1,981	1.6		619.7	619.7	619.8	0.1
Q	22,852	420	1,324	2.4		619.8	619.8	619.8	0.0
R	26,009	331	1,777	1.7		620.1	620.1	620.2	0.1
S	28,776	70	535	2.7		620.5	620.5	620.6	0.1
T	29,568	385	969	1.8		620.7	620.7	620.8	0.1
U	30,946	235	760	3.3		620.9	620.9	621.0	0.1
V	31,221	557	1722	1.6		621.1	621.1	621.2	0.1
W	33,692	266	622	3.8		622.2	622.2	622.3	0.1
X	35,138	192	504	4.6		623.5	623.5	623.6	0.1
Y	37,097	510	1,385	2.1		624.6	624.6	624.6	0.0
Z	39,273	305	883	2.9		625.3	625.3	625.4	0.1
AA	40,434	436	938	1.3		625.7	625.7	625.8	0.1
AB	43,391	430	1,425	0.4		625.8	625.8	625.9	0.1
AC	44,500	185	449	1.9		627.2	627.2	627.2	0.0
AD	45,107	450	1,314	0.7		627.3	627.3	627.3	0.0
AE	45,730	290	951	0.9		627.8	627.8	627.9	0.1
AF	46,469	176	692	1.0		627.9	627.9	627.9	0.0

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Turkey Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Turkey Creek									
AG	47,742	843	1,890	0.5		627.9	627.9	628.0	0.1
AH	48,687	79	214	2.5		629.3	629.3	629.3	0.0
AI	49,405	61	188	2.7		630.2	630.2	630.2	0.0
AJ	49,933	18	71	7.1		631.1	631.1	631.2	0.1
AK	50,741	220	388	2.5		633.3	633.3	633.4	0.1
AL	51,190	25	106	4.0		633.8	633.8	633.9	0.1
AM	51,554	27	105	4.0		634.7	634.7	634.7	0.0
AN	51,834	24	102	4.0		635.3	635.3	635.3	0.0
AO	52,034	150	220	2.8		636.9	636.9	637.0	0.1
AP	52,837	19	90	4.4		637.8	637.8	637.9	0.1
AQ	53,275	27	92	4.5		639.2	639.2	639.2	0.0
AR	53,698	55	175	2.6		641.5	641.5	641.6	0.1
AS	53,803	39	165	2.5		641.8	641.8	641.9	0.1
AT	54,226	49	268	1.6		643.7	643.7	643.7	0.0
AU	54,542	67	278	1.6		643.9	643.9	643.9	0.0
AV	54,806	39	141	2.8		640.3	640.3	640.3	0.0
AW	55,160	156	263	2.1		645.5	645.5	645.5	0.0
AX	55,598	132	581	1.0		649.1	649.1	649.2	0.1
AY	55,957	163	452	1.3		649.2	649.2	649.2	0.0
AZ	56,169	236	673	1.1		649.6	649.6	649.7	0.1
BA	56,607	220	526	1.4		649.7	649.7	649.7	0.0
BB	56,934	119	149	4.4		649.7	649.7	649.7	0.0

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Turkey Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Turkey Creek									
BC	57,219	44	155	2.7		650.5	650.5	650.5	0.0
BD	58,355	95	221	2.2		651.5	651.5	651.6	0.1
BE	58,993	20	129	3.5		656.4	656.4	656.4	0.0
BF [3]	61,987	N/A	N/A	N/A		662.3	662.3	N/A	N/A
BG [3]	65,440	N/A	N/A	N/A		669.5	669.5	N/A	N/A
West Creek									
A	7,780	1,067	1,924	1.4		635.2	635.2	635.3	0.1
B	10,030	2,136	3,015	0.9		636.9	636.9	637.0	0.1
C	12,930	179	954	2.7		639.9	639.9	640.0	0.1
D	15,570	869	1,567	1.7		643.8	643.8	643.9	0.1
E	17,610	535	1,876	1.4		647.2	647.2	647.3	0.1
F	21,610	453	1,344	1.9		651.0	651.0	651.1	0.1
G	24,320	471	1,684	1.5		652.1	652.1	652.2	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways [3]No floodway computed at this section

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

Turkey Creek, West Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
West Creek									
H	26,300	317	1,167	2.1		653.5	653.5	653.6	0.1
I	28,520	73	709	3.4		655.7	655.7	655.8	0.1
J	30,470	296	1,429	1.6		656.4	656.4	656.5	0.1
K	32,600	692	1,887	1.2		657.4	657.4	657.5	0.1
L	34,180	111	782	2.8		658.9	658.9	659.0	0.1
M	36,065	450	1,671	1.3		660.4	660.4	660.5	0.1
N	38,310	588	1,541	1.4		661.4	661.4	661.5	0.1
O	39,830	300	1,950	1.1		661.5	661.5	661.6	0.1
P	41,880	612	3,889	0.5		661.6	661.6	661.7	0.1
Q	44,390	1,486	6,041	0.3		661.7	661.7	661.8	0.1
R	46,240	400	860	2.3		662.2	662.2	662.3	0.1
S	47,890	1,202	3,061	0.6		662.5	662.5	662.6	0.1
T	49,990	1,805	8,745	0.2		662.5	662.5	662.6	0.1
U	51,390	430	1,278	1.3		662.7	662.7	662.8	0.1
V	52,820	600	864	1.9		663.2	663.2	663.3	0.1
W	55,720	184	753	2.2		664.9	664.9	665.0	0.1
X	56,860	184	761	2.1		665.4	665.4	665.5	0.1
Y	58,360	322	2,467	0.6		665.7	665.7	665.8	0.1
Z	60,380	600	2,344	0.6		666.1	666.1	666.2	0.1
AA	62,330	398	1,725	0.8		666.3	666.3	666.4	0.1
AB	64,090	1,507	1,795	0.7		666.6	666.6	666.7	0.1
AC	66,160	1,235	5,061	0.3		666.6	666.6	666.7	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

West Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
West Creek									
AD	67,860	576	1,440	0.8		667.0	667.0	667.1	0.1
AE	70,140	341	749	1.6		669.6	669.6	669.7	0.1
AF	72,840	88	392	2.6		671.8	671.8	671.9	0.1
AG	74,700	432	1,984	0.5		671.9	671.9	672.0	0.1
AH	77,300	288	1,410	0.7		672.5	672.5	672.6	0.1
AI	78,790	518	1,922	0.5		672.6	672.6	672.7	0.1
AJ	80,250	460	2,616	0.4		672.8	672.8	672.9	0.1
AK	81,960	709	4,405	0.2		672.9	672.9	673.0	0.1
AL	84,060	368	1,365	0.7		673.1	673.1	673.2	0.1
AM	85,810	900	932	1.0		673.2	673.2	673.3	0.1
AN	87,770	568	2,203	0.4		673.6	673.6	673.7	0.1
AO	88,750	1,077	3,115	0.3		673.7	673.7	673.8	0.1
AP	89,260	1,077	3,115	0.2		673.7	673.7	673.8	0.1
AQ	90,610	408	1,141	0.8		674.2	674.2	674.3	0.1
West Creek Tributary WJ									
A	1,250	357	911	0.8		674.0	674.0	674.1	0.1
B	3,020	164	562	1.3		676.4	676.4	676.5	0.1
C	4,110	103	390	1.8		678.3	678.3	678.4	0.1
D	5,500	145	583	1.2		680.7	680.7	680.8	0.1
E	7,740	1,354	7,117	0.1		680.8	680.8	680.9	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

West Creek, West Creek Tributary WJ

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
West Creek Tributary WJ									
F	9,160	345	622	0.9		682.5	682.5	682.6	0.1
G	11,130	49	177	3.2		689.9	689.9	690.0	0.1
West Creek Tributary WS									
A	3,100	96	793	1.9		674.0	674.0	674.1	0.1
B	5,150	154	337	1.6		680.3	680.3	680.4	0.1
C	7,200	176	224	1.7		691.4	691.4	691.5	0.1
D	10,550	357	433	0.9		702.1	702.1	702.2	0.1
West Creek Tributary WT									
A	1,520	95	259	2.2		659.5	659.5	659.6	0.1
B	2,610	48	179	3.1		662.7	662.7	662.8	0.1
C	4,590	286	438	1.0		665.0	665.0	665.1	0.1
D	5,860	161	352	0.9		668.1	668.1	668.2	0.1
E	10,080	168	284	1.1		682.5	682.5	682.6	0.1
F	12,450	192	956	0.5		694.3	694.3	694.4	0.1
G	14,300	244	638	0.8		694.9	694.9	695.0	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

West Creek Tributaries WJ, WS, WT

FLOODING SOURCE		FLOODWAY				1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY[2] (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
West Branch Tributary WX									
A	2,150	136	315	1.8		664.6	664.6	664.7	0.1
B	4,510	201	382	1.3		678.5	678.5	678.6	0.1
C	5,480	212	608	0.8		684.0	684.0	684.1	0.1
D	7,280	71	168	2.9		692.3	692.3	692.4	0.1
E	9,060	110	229	2.1		700.2	700.2	700.3	0.1
West Branch Tributary WY									
A	1,680	57	188	2.8		670.2	670.2	670.3	0.1
B	3,330	34	123	4.0		677.8	677.8	677.9	0.1
C	4,980	167	171	2.7		685.1	685.1	685.2	0.1
West Branch Tributary WZ									
A	750	168	505	1.2		670.4	670.4	670.5	0.1
B	2,200	76	251	2.4		674.9	674.9	675.0	0.1
C	3,330	305	1,528	0.4		688.7	688.7	688.8	0.1
D	5,790	173	373	1.5		690.9	690.9	691.0	0.1
E	8,530	164	219	2.5		699.5	699.5	699.6	0.1

[1]Feet Above Mouth [2]See Explanation in Section 4.2 Floodways

Table 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, INDIANA AND INCORPORATED AREAS

FLOODWAY DATA

West Creek Tributaries WX, WY, WZ